THE

BOOK OF THE FARM

DIVISION VI.

Wherefore come on, O young husbandman!
Learn the culture proper to each kind.

VIRGIL.

THE

BOOK OF THE FARM

DETAILING THE LABOURS OF THE

FARMER, FARM-STEWARD, PLOUGHMAN, SHEPHERD, HEDGER, FARM-LABOURER, FIELD-WORKER, AND CATTLE-MAN

BY

HENRY STEPHENS, F.R.S.E.

CORRESPONDING MEMBER OF THE NATIONAL AND CENTRAL SOCIETY OF AGRICULTURE OF FRANCE; OF THE AGRICULTURAL SOCIETY OF GALICIA; OF THE AGRICULTURAL INSTITUTE OF GOREGORETZK IN RUSSIA; OF THE ROYAL AGRICULTURAL SOCIETY OF SWEDEN; OF THE ROYAL IMPROVEMENT SOCIETY OF NORWAY

FOURTH EDITION

REVISED, AND IN GREAT PART REWRITTEN, BY

JAMES MACDONALD

OF THE 'FARMING WORLD';

AUTHOR OF 'FOOD FROM THE FAR WEST'; JOINT AUTHOR OF 'POLLED CATTLE,' 'HEREFORD CATTLE,' ETC., ETC.

IN SIX DIVISIONS

DIVISION VI.

WILLIAM BLACKWOOD AND SONS
EDINBURGH AND LONDON
MDCCCXCI

CONTENTS OF DIVISION VI.

*** *The* INDEX TO THE COMPLETE WORK *being included in this Division, the Contents are consequently not so copiously given as in the earlier Divisions, but reference to any subject under its title in the Index will supply the information required.*

PRACTICE—AUTUMN (*continued*).

FARM BUILDINGS.

BREEDS OF FARM LIVE STOCK.

AILMENTS OF FARM LIVE STOCK.

FARM-SERVANTS AND WAGES.

LIST OF ILLUSTRATIONS IN DIVISION VI.

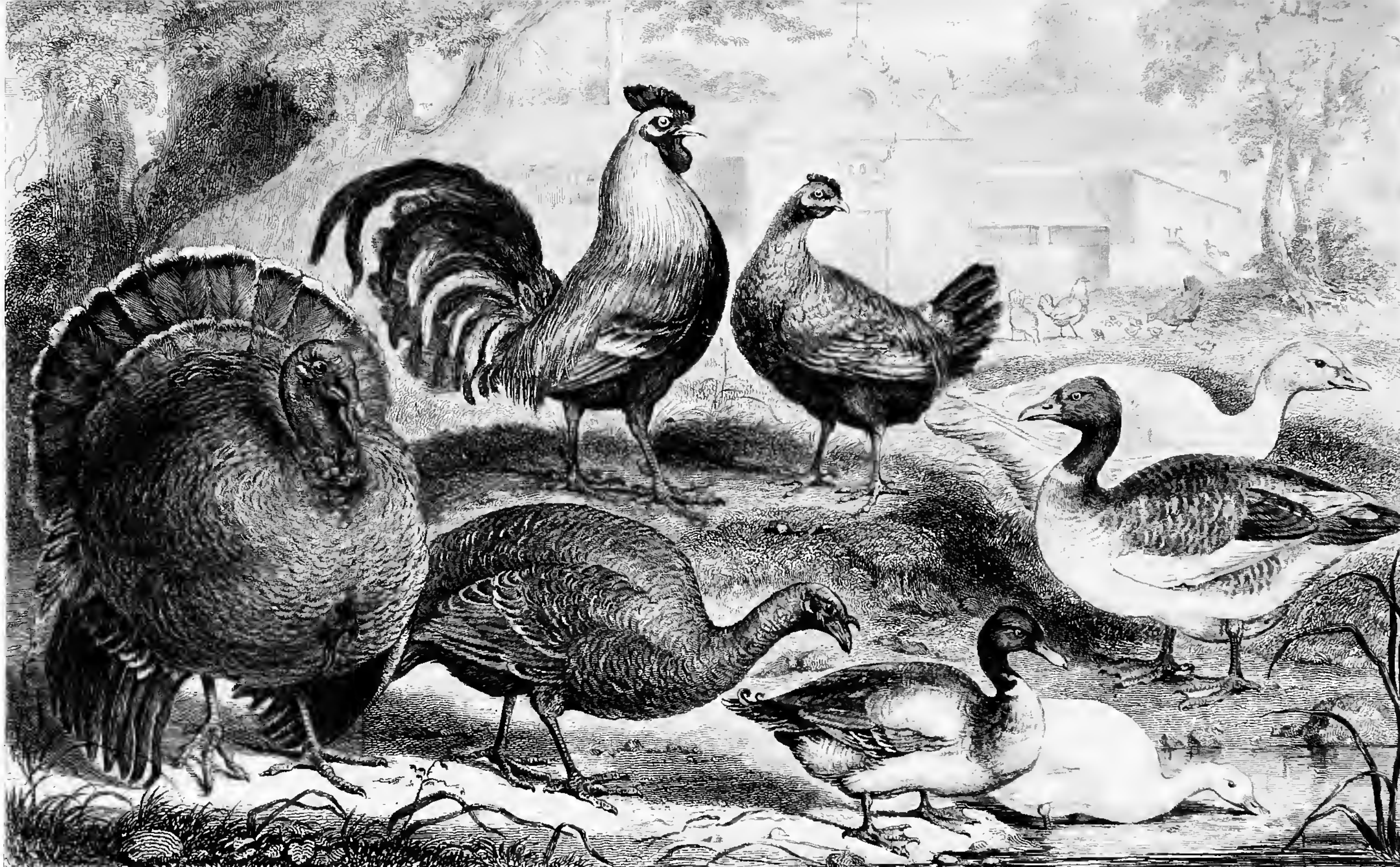
ANIMAL PORTRAITS.

FARM BUILDINGS.

GENERAL ILLUSTRATIONS.

AUTUMN—*continued.*

PLATE II



Gourlay Steell A.R.S.A. | J. C. Armytage

POULTRY.

Published by Wm Blackwood & Sons Edinburgh & London

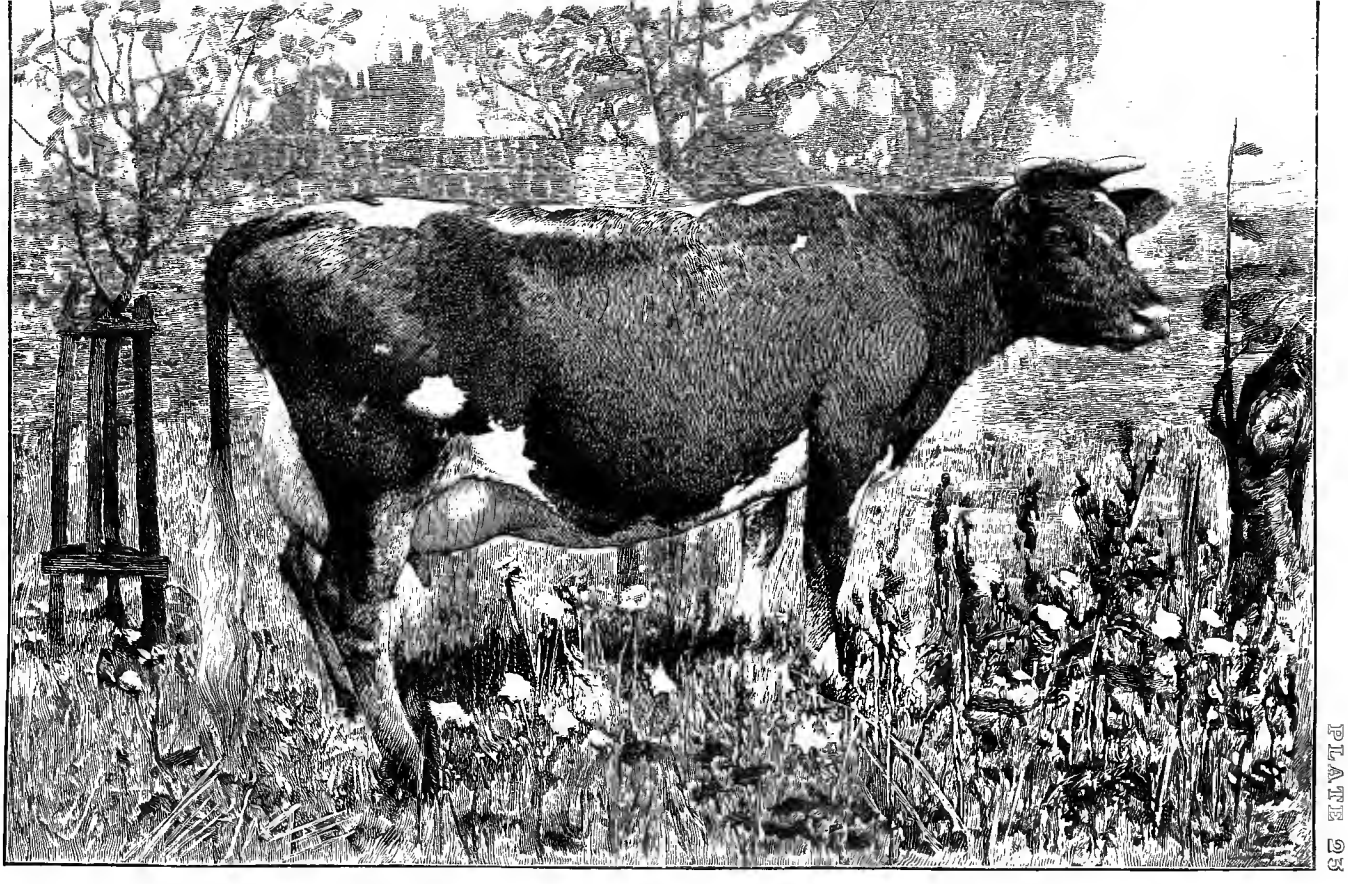
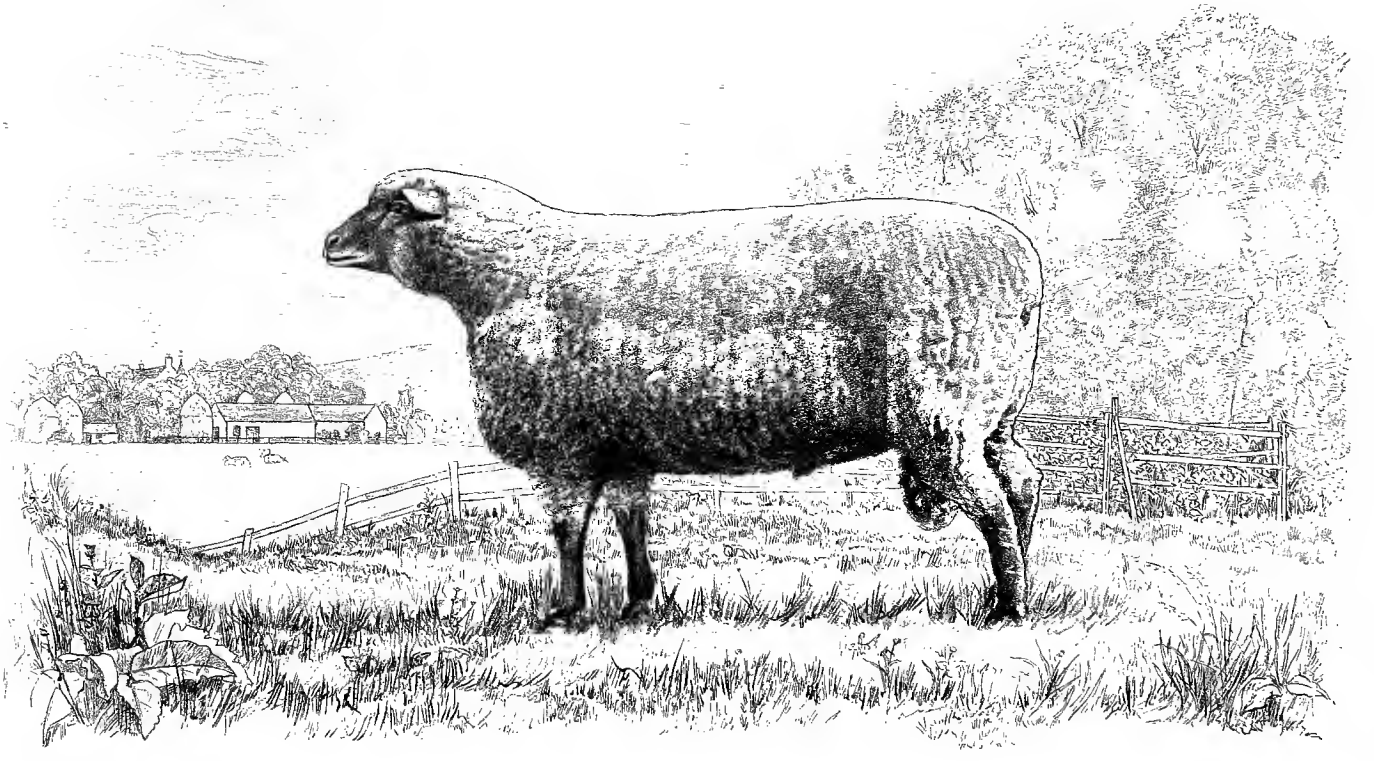


PLATE 23

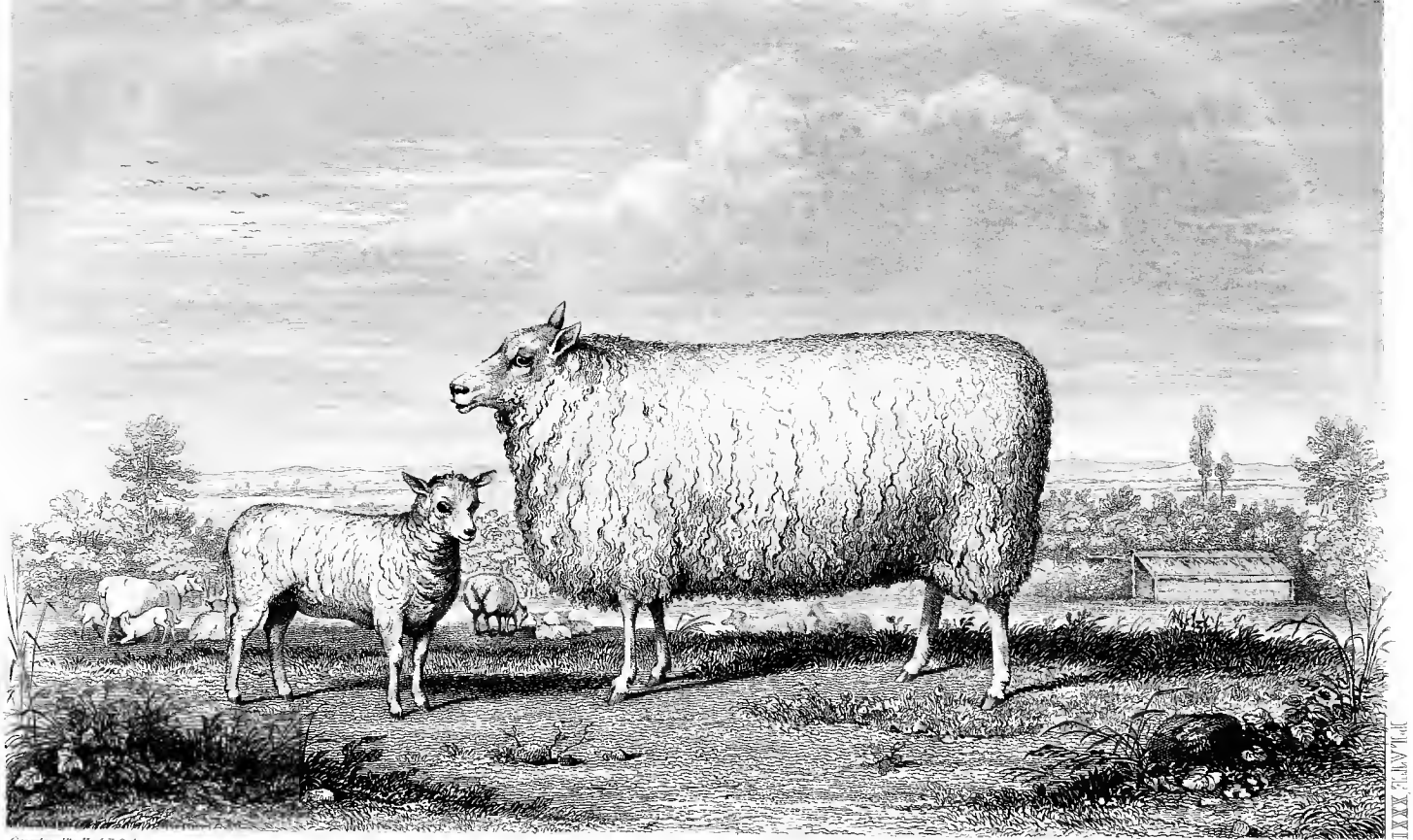
GUERNSEY COW, "RUBY FIRST," 370.

THE PROPERTY OF THE EXPRESS DAIRY COMPANY, LIMITED, COLLEGE FARM, FINCHLEY, LONDON.



OXFORD DOWN RAM, "ROYAL JUBILEE," 144.

BRED BY JOHN TREADWELL, ESQ., UPPER WINCHENDON, AYLESBURY.



Gourlay Steell A.R.S.A.

Thos Scott

PLATE XXXIII

BORDER LEICESTER EWE AND LAMB.

(1850)

MOLE-DRAINAGE.

On land of a suitable nature mole-drainage is frequently found to be a desirable substitute for pipe-drainage. It has, for instance, given satisfactory results in most of the eastern and mid-land counties of England.

Advantages.—The chief advantages it offers are that it is less costly, and that it may be more expeditiously carried out.

Its cheapness commends it specially to the tenant-farmer, for although it may require repetition after the lapse of from twelve to twenty years, the initial expense does not amount to more than from one-sixth to one-fourth of that of the ordinary method; hence it is from his point of view the more economical.

Different Soils and Mole-draining.—A strong firm clay or loam, free from stones, offers the greatest facilities for mole-drainage.

The presence of a few boulders, which may throw the implement out of the ground occasionally, need not be regarded as an insuperable obstacle. Very fine plastic clays are liable to shrink and crack excessively in dry seasons, thus allowing particles of loose soil to crumble into the conduit and choke it up; while, on the other hand, if the subsoil be too sandy or friable, it cannot retain the shape of the mole, the channel being obliterated by the collapse of its walls.

Mole-draining Permanent Pasture.—It is on land under permanent pasture that this system of drainage may be resorted to with the greatest prospect of permanency, and least injury to the surface.

The slit made by the coulter remains longer open under such circumstances, as there is little loose soil to fill it up, drawing off the rain-water and preventing the forming of pools on the surface.

Mole-draining Tillage Land.—In the case of land under cultivation, the seeds break affords the best opportunity of doing this work; and when seeds are down for several years, the last season, just before the land is broken up for a grain crop, is the time generally chosen. Occasionally the fallow break is drained, and, more rarely, the land on which wheat is actually growing; but it is obvious that a considerable amount of surface damage must result in either case.

Time for Mole-draining.—The surface of the field need not of necessity be perfectly flat or even, for the mole-plough may be raised or lowered to some extent to suit irregularities of surface, but it must admit of a moderate and

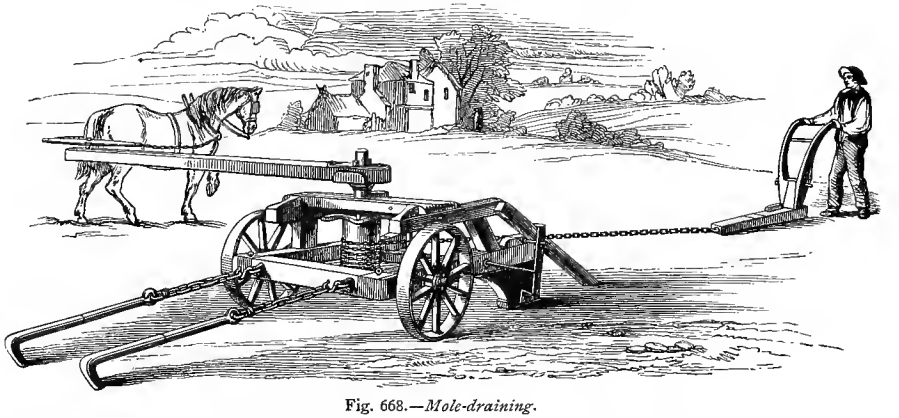


Fig. 668.—*Mole-draining.*

tolerably uniform fall being given throughout the entire length of each drain.

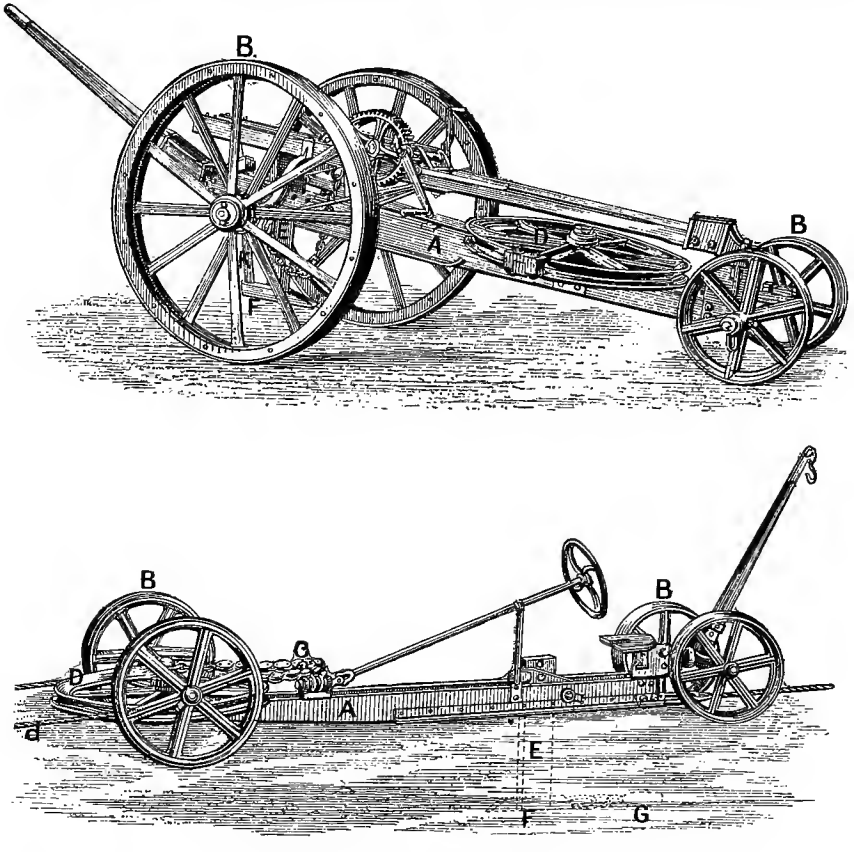
The time of the year at which mole-drainage may be commenced depends upon the amount of autumn rainfall. In wet seasons a start may be made in November or December; but the work has often to be postponed until February or March, when the winter's rains have made

the subsoil sufficiently soft. Autumn work, when it can be undertaken, has the advantage that the soil can bear the weight of the engines with least injury, and there is time for the inevitable compression of the surface to be counteracted by the frost before the following seed-time.

Process of Mole-draining.

Formerly the work of mole-drainage was performed by horse-labour through the medium of a windlass and horse-gear anchored at the higher end of the intended drain. See fig. 668, which, with the kind permission of Messrs Blackie & Sons, we reproduce from Morton's *Encyclopædia of Agriculture*. Now, however, the work is invariably done by the steam ploughing engine.

Mole-draining Ploughs.—The accompanying illustrations, figs. 669 and 670, of Fowler's larger and smaller draining-ploughs, show the construction



Figs. 669 and 670.—*Mole-draining ploughs.*

of the implement adapted for steam traction as now used.

In both of these ploughs the frame, A, is of wrought iron, and slides on the ground when the implement is at work; but when travelling from place to place it is raised in relation to the four wheels, B, upon which it is borne. The wheels are placed two in front and two behind, the front pair being connected with worm and pitch-chain steerage, in the same manner as the steam cultivator. Attached to the frame, in such a manner that it may be raised and lowered to regulate the depth of the drain, is a broad flat coulter, E, which carries a wedge-pointed "sock,"

F, at its lower extremity. The pitch or angle of the sock, in relation to the ground, may be adjusted by means of a rod and screw. The "mole," G, an iron clog, somewhat oval in shape, and about 3½ inches in diameter, is attached to the hinder extremity of the sock by means of a couple of links or a jointed bolt. It is this "mole," forced through the ground at the required depth, which forms the drain-conduit. The front of the frame bears the windlass, D, round which passes the steel-wire rope, *d*, from the engine. By the use of the windlass half the power required for direct traction is sufficient, but the rope must consequently be double the length of the drain. Any of the systems of steam cultivation (*q.v.*, vol. i.) are applicable to steam drainage. Sometimes two engines are used, usually 14 horse-power; occasionally one engine and roundabout tackle; but more commonly an engine, placed at the higher side of the field, draws the mole-plough when at work, a team of horses returning it out of work to the lower side.

Outfall.—Nothing is more injurious to these drains than the presence in them of standing water, and, to avoid this, a free and ample outfall should be secured before the work of mole-drainage is commenced.

Main Drain.—The main is cut in the ordinary manner along the lowest side of the field, and laid with pipes of a calibre

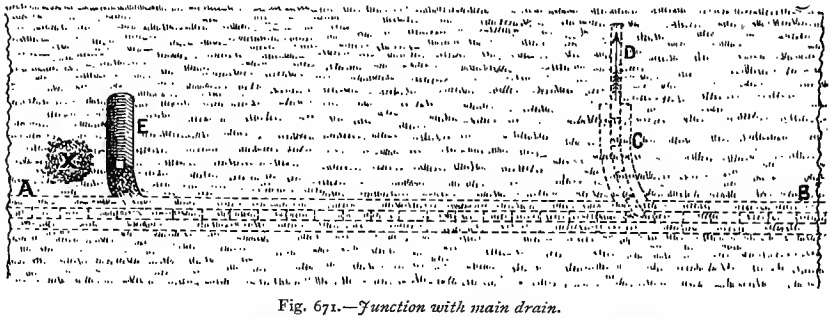


Fig. 671.—*Junction with main drain.*

A, B Main drain piped and filled up.
C Branch, also piped and filled.
D Mole-track, the arrow showing the direction in which the mole-plough has been drawn.
E Branch left open to receive the mole.

in accordance with the area to be drained. Brushwood and sundry other materials occasionally take the place of pipes, but there can be no doubt as to the superior economy of the latter.

The main should be six to nine inches deeper than the mole-drains, to facilitate the discharge of the water into it. Before returning the earth over the main pipes, branches, four to six feet in length, are cut at the proper distances apart, to form the terminations of the mole-drains and to connect them with the main. In each of these branches a couple of pipes may be laid, to form a junction with the main, which is then filled up. Part of the branch, E, fig. 671, say three feet in length, is left open, so that the mole may be dropped into it and start work at the proper depth.

Auxiliary Mains.—When the field is more than ten chains in width, it is advisable to cut an auxiliary main across the middle of it, so as to relieve the strain on the mole-drains.

When depressions traverse the field in any direction, it becomes necessary to lay a main along each. To obviate the trouble and expense of connecting the mole-drains with the auxiliary mains, the latter may be cut nine inches deeper, and the trench having been filled up with gravel, B, fig. 672, to a depth of 12 or 15 inches above the pipes, and the soil returned to the top of this, the mole may be drawn through the gravel, when its water will readily percolate to the pipes, A.

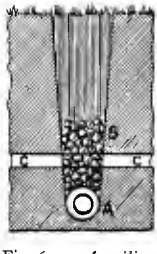


Fig. 672.—*Auxiliary and mole-drains.*

A Pipe of auxiliary main.
C Mole conduit drawn through gravel, B.

On some parts of the Essex coast, where cockle-shells may be had in abundance, they are used instead of gravel, for which they form an excellent substitute.

Depth of Mole-drains.—In the days of horse-traction mole-drains were made as shallow as eighteen inches; but with steam-power the common depth is 2½ feet, and occasionally 3 feet.

Channel.—The mole is usually 3½ inches in diameter, and, when this has forced its way through the soil, it leaves a channel at first about three inches in bore. The compression of the sides of the conduit by the mole is no doubt a disadvantage; but this is largely counteracted by the slight upheaval of the soil, and by the slit which the coulter leaves behind it.

Distance apart.—The distance apart at which the mole-drains are made varies considerably according to the nature of the soil and the regularity of the surface. When there are high-backed ridges to take into account, the drains are best drawn up the furrows, and may be eight or ten yards apart; but when the surface is flat, one rod is a favourite and convenient width.

Coulter-track.—In order to prevent the coulter-track opening too widely during times of drought, it is a useful practice to run the ordinary plough along the course of the proposed drain to turn back a furrow-slice; then, when the mole plough has been drawn up the grip so formed, the furrow-slice is laid over into its original position, forming a flap over the opening left by the coulter, and preventing the earth from falling into it (see fig. 673).

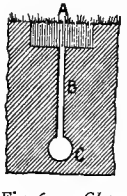


Fig. 673.—*Closing coulter-track.*

Method.—When all the necessary preparations have been made, the mole is dropped into the open branch, and, the engine being set in motion, the draining-plough is slowly pulled to the higher side of the field. It is drawn back to the lower side by the other engine, by horses, or by steam tackle, to start again from the next branch, the operation being repeated until the whole field is drained.

Whenever beds or pockets of sand are noticed, indicated by the implement slipping rapidly through them, they should be at once marked, in order that the mole-channel may there be opened and laid with pipes. This precaution will save much trouble from subsequent derangement.

Contracting, and Price for Mole-draining.—Drainage of this kind is sometimes contracted for at so much per acre for mains, pipes, and mole-drains, all complete. It is also undertaken at a fixed price per chain, usually 4½d. to 6½d., depending upon the depth and calibre of the drain, and upon the nature of the ground, the farmer in this instance providing the mains, and supplying coal and water for the engines. A third and common arrangement is for the contractor to supply one engine and tackle, or two engines, and the draining-plough, together with a ploughman, and an engineer for each engine.

A fair day's work may be reckoned at 300 to 350 chains.

Cost per Acre.—Respecting the cost per acre, let us take, for example, a field ten chains in width, with mole-drains at one-rod intervals: each chain-length of such a field will have four mole-drains, measuring together forty chains. Under average circumstances the items of cost against the farmer might be thus approximately stated:—

	Per acre.
Hire of steam-power, mole-plough, engineers, and ploughman, at 5d. per rod	£0 15 0
Coal	0 1 6
Cartage of coal and water	0 0 9
Cutting main (1 chain), laying pipes, and filling	0 2 3
Pipes for main	0 3 0
Digging "branches" at 3d. each	0 1 0
Sixteen 3-inch pipes for branches	0 0 6
	£1 4 0

It is sometimes necessary to continue the main to a brook or ditch at a distance from the field, thereby augmenting the cost.

When the farmer owns the engines and plough himself, the expense may be reduced to, say, 18s. or 20s. per acre.

Cost of Mole and Pipe Draining Compared.—In comparing mole and pipe drainage as to economy, we must allow 5 per cent interest on—

	£	s.	d.
6s. 9d., the more permanent part of the work	£0	0	4
And, on the cost of mole-drains, 17s. 3d., an annual sum sufficient to pay 5 per cent and refund the capital outlay in, say, 14 years .	0	1	9
Total annual charge	£0	2	1

Duration of Mole-drains. — The duration of mole-drains varies greatly, according to the nature of the subsoil, the amount of fall, and the manner in which the work has been performed. When well done and in a suitable soil their average life may be estimated at fourteen or fifteen years; under less favourable circumstances eight or ten years; whilst occasionally in a very firm subsoil they may be found in working order at the end of twenty or even thirty years.

Destruction of Mole-drains.—The ultimate destruction of mole-drains is usually due to their becoming blocked by silt or roots, or to the collapse of the sides and roof of the conduit under the continued action of the water passing through it.

Enemies of Mole-drains.—The live mole and the water-rat are amongst the most dangerous enemies of mole-drainage, and their thorough extermination is necessary to its preservation.

Repair.—The repair of mole-drains is always unsatisfactory. Short lengths may be patched up by cutting them open and laying with pipes.

When the mains have been properly laid they may be regarded as permanent, and new lateral drains may be connected with them as often as the land is re-drained.

SURFACE-DRAINING.

Thorough, methodical, "surface" drainage, variously called "open draining" or "sheep-draining," is quite as essential to the successful management of our higher sheep-walks, where the nature of the ground and the value of the land render the more expensive systems impracticable, as deep drainage is to our arable lands and old pastures.

Considerable skill is required to carry out effectively and economically the surface-drainage of hill-farms.

Form of Surface-drain.—The ordinary surface-drain is a ditch 20 to 22 inches wide at the surface, 18 to 20 inches deep, and 4 to 9 inches wide at the bottom. Where the soil is of a sandy nature, or "rotten" friable peat, the sides should have a greater inclination; whilst if boulder-clay or other stiff soil, or tough fibrous peat, the sides may be steeper.

Caution in Surface-draining. — "Flows" or flat bogs, producing "draw-moss" (the *Eriophorum vaginatum* of botanists), so invaluable for spring food, must be dried with caution. Draw-moss can flourish only where there is abundance of moisture, and on such land no other plant will yield half so great an amount of food. Hence bogs of this kind should be dried only sufficiently to allow the sheep to feed upon them with safety and comfort. It is by no means difficult to overdo the surface-draining of hill pasture, and in this matter there is need for the exercise of great care and practical experience.

Distance apart.—In draining "flows," therefore, wide distances, 20 to 100 yards, are adopted, as the condition of the surface may indicate.

In grassy hollows and slopes much greater frequency is desirable, as these, save in exceptional cases, cannot so easily be made too dry.

Occasionally it is expedient, in remote situations, to preserve a certain quantity of "sprit" (*Juncus articulatus*) for thatching purposes, and as after drainage that plant is displaced by others, it may be desirable to leave certain patches undrained on that account. Under ordinary circumstances surface-drains are cut in such land six to ten yards apart.

Arrangement of Surface-drains.—The general arrangement is similar to that recommended in the case of deep drainage.

The mains, which are somewhat larger than the lateral drains, are usually cut along the bottom of the slope, the lateral drains entering them at regular intervals. The lateral drains should curve in the direction in which the water is flowing, at their junction with the mains, to lessen the risk of silting up.

On long slopes, sub-mains should intercept the lateral drains where required, to prevent the washing out of gullies along their course.

Cutting Surface-drains.—The cutting of surface-drains can be best done by skilled men who spend the whole or nearly the whole of their time at the work. The work is most economically performed by two men together. One cuts the sides with the "ritting" spade, while the other shovels out the bottom of the drain. The turfs are taken out by the latter with a two-toed hack with curved handle, and prongs about 10 inches in length, while the former detaches them with the cross-cut spade, using the handle as a lever to assist in starting.

Placing the Sods.—The sods should be deposited on the lower side in a regular line, not less than two feet from the edge of the drain, so that they may not readily fall into it if disturbed by cattle.

Cost.—The price, dependent upon the nature of the soil, varies from 3d. to 6d. per chain, when the ordinary tools are sufficient; but if the trenching-spade be required, the cost may amount to 7d. or 8d. per chain.

Repairing Surface-drains.—Surface-drains ought to be cleared out at frequent intervals, at least once every eight years on black ground, and every five years on green land.

Note.—In the portion of the chapter on Drainage in Divisional vol. v. a typographical error occurs. In the paragraph on "Submains," p. 261, it is stated that "Any necessity for making the minor drains of a greater length than *two* chains may be obviated by providing sub-mains." It should be read as *ten* instead of *two* chains.

IMPROVING WASTE LAND.

The method to be pursued in the reclamation of waste land will of course depend very much upon the character and condition of the land to be operated upon. Throughout the British Isles vast tracts of rough uninviting land have been, by the enterprise of landowners and tenant-farmers, reduced to a useful condition for arable or pastoral farming—the cost of reclamation in many cases exceeding £10 per acre, not unfrequently running to £15, £20, or more, per acre. In recent years less has been done in this way than formerly. In most parts of the country the limits of advantageous reclamation have been nearly reached; in some cases they have been exceeded, and it is hardly probable that there will be great activity in this direction in the immediate future.

Still there are, no doubt, considerable areas of land which might be reclaimed with advantage, so that the methods of improving waste land demand notice here. At this time of day, however, brief notes will suffice.

Rules for Land Improvement.

We cannot do better than produce here the following rules, laid down by the late Sir John Sinclair, Bart., for the improvement of waste land, which are as applicable to the present day as to the time in which he wrote:—

1. Not to put in practice any scheme of improvement without the fullest consideration, nor without the command of an adequate capital.

2. Not to begin on too great a scale, nor until, by experience, it be found that the design is suitable to the soil, situation, and climate.

3. When the intention is to cultivate bogs or peat-mosses, not to begin cropping till at least one season after the drains are completed, and the soil thoroughly reclaimed from superfluous water.

4. To plough or delve peat-mosses in autumn, that it may first be effectually exposed to winter frosts and rains, and not to summer heat, which would harden it and prevent its decomposition.

5. Whatever is done, to do it effectually,—not to think of laying on four acres the manure necessary for three, nor the lime, chalk, &c., required for two given to one.

6. To carry on the improvement of waste lands without encroaching upon

the dung necessary for the improved part of the farm; and

7. To lay down any land improved from waste, in high and bleak situations, as soon as possible into grass, and to retain it in that state as long as it is tolerably productive. For though grain and roots may be cultivated on waste lands, when properly improved and favourably situated, yet grass land pastured particularly by sheep is principally to be depended upon for improving weak soils in barren districts and remunerating the improver.[1]

Scotch Example.

We have in our mind an instance of somewhat extensive improvement effected upon waste land in the north of Scotland, in which these rules were carried out to a considerable extent during the progress of the work.

Original Condition of Land.—This farm before the improvements were begun consisted of heath, with patches of mixed waste land which had been at one time under cultivation. For many years the whole farm had been under sheep.

Steading.—The position for the steading was chosen near the centre of the land to be brought under cultivation, and at a level where all the water drained from the higher ground could be used for driving the threshing-mill, and for other purposes.

Process of Reclamation.—The first part of the operation was laying off the land near the steading into fields of about 20 acres each. Along the boundary-lines of the fields open ditches were cut during the first year. Into these ditches the leaders for the furrow drains were made to fall, and after about 40 acres were furrow-drained, the whole was ploughed as deeply as possible. Two men followed each plough, one holding the plough and the other turning over any part of the furrow the plough left unlaid, and marking the position of land-fast stones by means of wooden pegs.

Cropping.—During the first year very little of the land was put under crop. The only parts so treated were where the land admitted of being brought into ordinary tilth. The rest was allowed to lie until the succeeding spring or winter, when it was again ploughed, and then made suitable for the reception of seed. In the second year the land sown with oats was put under turnips, and as time went on the turnip break was gradually increased. A second crop of oats was taken where the land was rough and the turf not decayed.

Part of the land being peat-moss, the drains were put down to the clay if practicable; but where this could not be done 5 feet was about the average depth. A considerable time was allowed to elapse before ploughing was commenced, so as to allow the drains to dry the land, and to let the boggy parts settle and consolidate.

In the course of some ten years over 600 acres were in this instance reclaimed, the entire work being done by the ordinary implements of the farm, with little extra strength, except where the land was much broken and rough, when labourers had to be engaged to fill up the holes and delve such of the roughest places as horses could go over it.

Result.—Even the first rotation of crops left the land level and fairly planted with grass. From the success in this instance one would infer that in the reclamation of land extra time may lessen expense to an extent out of all proportion to that required to effect the same object in a shorter period.

Stones.—The stones turned up were used for building dykes, forming leader drains, and making the farm-roads.

Other Methods.

In other cases, where the surface of the ground is rough and much covered with hassocks of coarse grass, it requires to be brought into cultivation by other means than the plough. When the ground is the site of an old plantation, it is impossible to bring it in with the plough. When the subsoil contains a large quantity of stones, of whatever size, it may not be possible to stir it with the plough. Where much brushwood exists—as of hazel, alder, birch, broom, and whin—the plough should not be tried.

Trenching.—To bring the land soon into cultivation in all these cases the best method is to trench it with the spade. Spade-work is expensive, but it is effec-

[1] *Rural Cyclopædia.*

tive amongst roots and stones, and the ground is put by it in so prepared a state that the succeeding operations are executed with ease and satisfaction.

Reclaiming Plantation Ground.—In trenching the site of a removed plantation, a good plan is to mark out the ground in divisions of 30 feet in breadth. Three men working together will do more and better work than each man alone, the one assisting the others when extracting the roots of the trees.

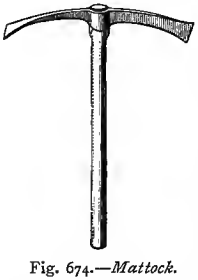


Fig. 674.—*Mattock.*

No implement is so efficient in cutting the ramified roots of a tree as the common mattock, fig. 674, which on one arm has a horizontal cutting face, and on the other a vertical. It is used like a hand-pick, and one or both faces alternately are required to cut through a strong root. An axe would soon be blunted by the earth adhering to the smaller roots, though a large root is easier cut through with an axe than a mattock.

The roots and stools, great and small, are laid upon the surface of the trenched ground behind the workmen, and the hollows left by them in the ground filled up, and the surface levelled.

Trenching Stony Ground. — In trenching very stony ground, the foot-pick is the most efficient implement for loosening them out of the subsoil. The crowbar or pinch is required to raise what cannot be effected by the foot-pick; and the largest boulders may have to be blown to pieces by gunpowder or dynamite. The stones are laid upon the trenched ground. In many parts stones are so numerous in the subsoil that they are not only sufficient to form the drains for the land, but that to get quit of the overplus, "consumption-dykes," several feet in height and breadth, are built in lieu of fences. As many as 800 tons of stones have been trenched out of one acre in the county of Kincardine, in the north-east of Scotland.

Draining.—In improving the site of a plantation, or very stony ground, it should be trenched before being drained, as the cost of draining would be much increased amongst roots and stones.

Depth and Cost of Trenching.—No trenching among tree-roots and boulders should be less than 18 or 20 inches deep of the solid ground. The cost of such depth of trenching may be heavy, but then by it rough useless land is at once brought into a fit condition for cropping. Although trenching may not be the cheapest mode of making land available to the plough, it is the most pleasant and satisfactory.

Trenching may be executed at any season. To allow time for subsequent operations, however, it is best and most comfortably done in the long dry warm days of summer. Small hollows and heights should be levelled in trenching. The contractor should be bound to be always with his workmen, and the farmer should have a superintendent to overlook the work, as even the contractor may direct the men to make the trenched ground seem as high as it should be, although the solid ground has not been dug to the proper depth.

Removing Turf.—If turf is desired for any purpose, it may be cut from waste land about to be improved. In many parts good tough turf is not easy to be obtained, and at all times it fetches a high price. A man will cast from four to six cart-loads of one ton each in a day, according to the smoothness and softness of the ground.

In most cases, however, the best plan will be to reclaim the land as it stands, ploughing down the turf as in the Scotch instance referred to.

Levelling Ridges.—In levelling high, gathered-up, crooked ridges in clay soil, much precaution is requisite, because the soil, exposed after the lowering of the ridges, will take some time to be rendered fertile. James Carmichael, Raploch farm, Stirlingshire, thus describes his mode of doing it:—

"In winter, ploughing the land intended to be levelled and straightened in the succeeding summer, the plough was entered in the side of the ridge, exactly in the middle between the crown and open furrow; and thus one-fourth of the ridge was *gathered up* from the open furrow on each side of the ridge, while the open furrow was left as open and deep as

possible. The remaining half of the ridge was then *cloven down*, without gore-furrows, the crown being laid completely bare, so that every ridge was divided into two. The work thus remained high and dry during the winter.

"In May or June following, the plough *gathered up* about 2 feet on each side of the crown of the ridge of the exposed subsoil, which was about 5 feet in breadth. After this it was ploughed into drills, and removed, either by shovels or with a two-horse levelling-box, into the deep open furrows. The plough was again employed to make drills in the crown, and the subsoil removed into the open furrows; and the same operation was repeated until the open furrows were raised apparently above the level of the crowns. This being done, part of the formerly accumulated soil on the sides of the ridges was *cloven down* by the plough upon the recently removed subsoil in the open furrows on the one hand, and upon the bared crowns on the other hand. The land was then cross-harrowed, and two times cross-ploughed and harrowed alternately as deep as possible, and every inequality removed before the ridges were re-formed straight.

"The whole process is exceedingly simple, and its advantages are perfectly obvious: for while every particle of the original surface is thus carefully preserved, the subsoil is so sparingly and equally incorporated with it, that not a doubt can remain of the beneficial result of the operation. Where the ridges have been very broad and high, it will be found necessary to remove part of the subsoil from the sides of the ridges also after the crown has been refilled, particularly when the subsoil is tilly; but this is easily performed by two or three women or boys going after the plough and throwing the remains of till turned up into the furrows; or should the ridges be too broad for this, the levelling-box will effect the purpose."

The labour attending this operation will depend on circumstances, such as the breadth and crookedness of the ridges, and the strength of the clay soil. In dry weather the operation will be more expeditiously and better done than in wet, the soil being rendered light by the heat of the sun. In changeable weather no more subsoil should be ploughed than can be removed during the course of the day.[1]

Levelling Land.—Besides larger inequalities of surface, minor ones require emendation, the neglect of which renders the surface of improved arable land unpleasant to the sight. The inequalities we allude to are slight hollows, low heights running across several ridges, making one side or part of a ridge higher than the other, or part of the head-ridge higher than the ridges, and suchlike blemishes.

Levelling-box.—The best and most economical method of getting quit of them is with the levelling-box, fig. 675, which, according to the nature of the soil to be removed and the distance to be carried, may be worked by one or two horses. The two sides having the same depth where they join the back, are curved off to nothing at the front. It is requisite for strength that it be made of hardwood; but the common willow, from its toughness and lightness, is perhaps better adapted than any other wood for this purpose. The sole of the scoop is armed with a strong shoeing of iron, terminating in a sharp cutting-edge. Two skeds or bolsters are fixed on the lower side of the sole, thinned off forward to give facility of entrance in the soil to the cutting-edge of the scoop, and upon which it runs like a sledge when filled. All the corners are strongly bound with iron plates, and the skeds upon which it runs are covered with strong sheet or hoop iron. The handles are bolted to the sides, and so fitted as to bring their extremities to a convenient distance for being held in the hands of the conductor. The draught-chains, with their stretcher, are attached to an eye-bolt or a staple on either side of the scoop.

The levelling-box is used in this manner. After the plough is first made to turn over the soil lightly on the height to be removed, the levelling-box, worked by one pair of horses, then follows, and takes up from one end of the ploughed ground as much soil as it can contain, the conductor holding by the stilts or handles. The box is filled by the conductor allowing the handles to rise as much as that

[1] *Trans. High. Agric. Soc.*, ix. 37-39.

the edge of the sole shall bite the ground; and on these being drawn forward by the horses, the box is filled to any extent, when by the handles being pressed down the front edge is relieved from the ground, and the machine travels upon its skeds. On arriving at the hollow place to be filled up, the conductor, by raising up the handles, capsizes the box, and gets quit of the load of earth, the handles falling and resting upon the stretcher; and whenever it is emptied, he levels the earth by passing the box over it.

The box is returned to its working position upon its bottom immediately, or it may move along upon its mouth, smoothing the surface till it reaches the ploughed soil, when, by a sudden pull of

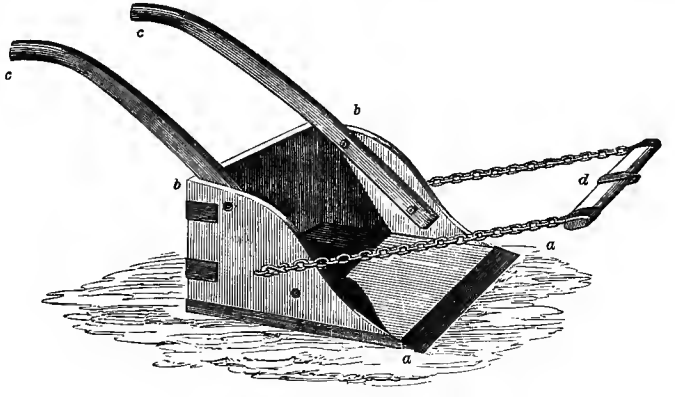


Fig. 675.—*Levelling-box, or scoop.*

b a, *b a* Two sides of box.
b b Back of box.
a a Sharp edge of iron sole.
c c Handles.
d Stretcher attached to the draught-chains.

a rope attached to one of the handles, it regains its working position.

In all these movements the horses are not stopped, but proceed from one place to another as directed, while the box is filling and emptying in constant succession. A strong active man is required to work this implement.

Cropping New Land. — Land so drained and trenched usually bears for its first crop either potatoes or turnips—that is, if a sufficiently fine tilth can be obtained. Turnips are generally preferred to potatoes, because they may be eaten on the ground by sheep, and thus at once put the drained land into a state of comparative fertility. Where the land is ploughed, oats are a favourite crop for the first, because it assists in rotting turf quicker than green crops. Where grass has been ploughed, it is the best first crop that can be taken. Waste land broken up by the plough cannot be made suitable for a turnip crop, it being so rough and tough that ordinary implements have little or no effect in breaking down the furrows.

An Irish Example.

On the estate of Brockley Park, Stradbally, Queen's County, a scheme of successful improvement of land carried out by the proprietor, Mr William Young, is worthy of description here.

Original Condition of the Land.—When Mr Young succeeded to the estate, about 1860, it contained a considerable area of rough, "cut-away" peat bog. Uneven in the surface, and full of stagnant water, it was in parts so soft and boggy that people or animals could not safely walk upon it. The drier portions were covered with furze and scrubby hazel bushes; while the other parts carried a strong growth of reeds and rushes. This rough land was almost worthless except as a resort for snipe and wild duck. Anxious to turn it to some good account, and to give employment to the people, Mr Young decided to reclaim it.

Process of Reclamation.—In the first place the land was under-drained with tiles and collars, great difficulty having been experienced in many parts in getting

the drains formed, owing to the extreme fineness of the sandy subsoil. In fact, here and there it was found necessary to use boards in binding up the sides of the drains.

The land (except where it was so soft that horses could not walk upon it) was then ploughed twice—the one furrow at right angles to the other, and the large cross-cut sods were left exposed to the winter's frost. Some of the softer spots had to be cut and levelled with the spade.

First Crop.—In the following spring the ploughed land was harrowed, the roots and rougher sods burned, and the ashes spread over the surface. It was then sown with rape. The rape plants came irregularly, and the crop was not of much value. It, however, cost very little, and the action of its roots, together with the treading of the sheep that consumed it, assisted in breaking up the surface and in preparing it for further cultivation.

Second Crop.—The first crop having been eaten off by sheep, the ground was again ploughed, and, in the following June, sown with 14 lb. of rape and about a bushel of Italian rye-grass per Irish acre. A top-dressing of 3 cwt. of Lawes's turnip manure was allowed to the Irish acre; and with that treatment the land gave a good crop. This crop was also eaten off the land by sheep. It made excellent feeding the first autumn; and the sheep having had an allowance of cake upon the land, the rape and grass came up well the following spring, affording a very useful change for ewes and lambs.

Third Crop.—In May of that year it was once more ploughed up, harrowed, and drilled, and manured with about 25 tons of farmyard manure and 3 cwt. of Lawes's turnip manure per Irish acre. The main portion was planted with cabbage, but wherever the tilth could be made fine enough, turnips were sown. Both these crops were heavy and of good quality, and both were consumed on the land by sheep.

Laying to Pasture.—The land was now in a fit state for being laid down for permanent pasture. It was clean, in good heart, and wonderfully fine in the tilth. Accordingly, as soon as the turnip and cabbage crops were consumed, the land was again ploughed, and in May in the following year sown with 4 lb. of rape, 1 bushel of vetches, 1½ bushel of perennial rye-grass, ½ bushel of Italian rye-grass, 4 lb. of cocksfoot, 4 lb. of timothy, and 4 lb. each of alsike and white clover per Irish acre. This crop came up exceedingly well, giving a close heavy yield. In the autumn of the same year—in August and September—it was consumed on the land by sheep. The crop was so rank that much loss would have been sustained by allowing the sheep to trample upon it, and therefore they had to eat it through wooden hurdles. These hurdles, made for the purpose at Brockley Park, were light, with upright bars. They were shifted forward every second day; and with a scythe a "swathe" or "bout" of the crop was thrown up against them every morning. The sheep were allowed a moderate quantity of cake along with what they could eat through the hurdles, and thus the land, while robbed of its richness through the crops it yielded, was being recuperated by the droppings of the sheep.

Results.—The results of the treatment briefly described were eminently satisfactory. The sheep were withdrawn from the land during winter, and next spring there came up a beautiful growth of permanent pasture. No accurate account of the cost of the reclamation could be given, as the work was carried out from time to time along with other estate improvements, and with the ordinary operations of the home farm. Mr Young, however, feels certain that these crops to which we have referred fully repaid him for the cost of reclamation, and that the permanent value of the land is increased at least five-fold.

Improving Poor Land.

Another and larger portion of Mr Young's property at Brockley Park, mentioned above, consisted of poor worn-out land. This presented difficulties of a different character, which were also successfully overcome. This land, like a great deal of the poorer and partially waste lands of Ireland, consists of a thin, moory, or peaty soil, with sandy or gravelly subsoil. Such land is generally kept in what is called "pasture," on which a few half-starved cattle drag out a miserable existence.

One great hindrance to the improvement of land of this class is that a large extent of it is of so poor a nature that when reclaimed it cannot be calculated upon as certain to prove remunerative under either arable farming or mixed farming, or as likely to carry permanent pasture with any reasonable degree of success. We therefore look upon Mr Young's system of improving and utilising such land as of the utmost public importance.

He found, in the course of some years' experience, that even after being thoroughly drained, it would not pay under any system of regular cultivation. It would not even repay him for his outlay in an ordinary course of corn and root crops. As the manure seemed to go down through the subsoil and give no adequate return, it was only when under grass that the land was really useful.

Renewing Pasture.—But seeing that the land would not carry a sufficient cover of pasture for more than two or three consecutive years without the grasses being renewed, and seeing also that a course of cropping — the usual method adopted when grasses have to be resown—always resulted in a loss (the crop being so poor as not to repay seed, labour, and manures), it became necessary to devise some other means by which the grasses might be profitably and effectively renewed. This stubborn difficulty was at last successfully overcome by the adoption of the following treatment, which we have no doubt might with much advantage be pursued in many similar cases.

When the permanent pasture on any field or division was observed to be giving way, the short sweet cover of grass which usually came up early in the season was at once eaten down by sheep, and then the land (that is to say, the field or portion giving way) was ploughed up in the first week of June, and immediately sown down with 10 lb. of rape and 1½ bushel of Italian rye-grass per Irish acre. It was at the same time top-dressed with 3 cwt. of superphosphate and 2 cwt. of Lawes's special manure per Irish acre, the value of this dose ranging from 35s. to 40s. per Irish acre. The rape and rye-grass generally came up rapidly, and were eaten down by ewes and lambs about the middle or end of August. During winter the land was left clear, and early next spring it again presented a nice rich cover of rape and rye-grass, which was once more eaten down by ewes and lambs.

In June of that year it was ploughed up as in the previous year, manured as on that occasion, and then laid down into permanent pasture. The seeds sown upon the Irish acre were 4 lb. of rape, 14 to 20 lb. of vetches, 2 bushels of perennial rye-grass, ½ bushel Italian rye-grass, 4 lb. of timothy, 4 lb. of cocksfoot, 4 lb. of alsike clover, and 4 lb. of white clover. In the part where clay and not bog or moss prevailed, 4 or 5 lb. of red clover were added; while for the purpose of learning the young sheep to eat roots, a very small quantity of turnip-seed was also thrown in.

Result.—The land thus treated was generally ready to carry sheep some time in August, and, without exception, the pasture laid down in this manner has excelled that sown in the course of an ordinary rotation. The rape and vetches afford useful feeding for sheep—no cattle are put upon the land—early in the first season; afterwards the vetches die out and leave a wonderfully close rich cover of grass and clover. The sheep take very kindly to this sort of food, and thrive remarkably well upon it.

Mr Young finds it advantageous to sow, for variety of feeding, a small patch of mustard instead of rape. The mustard plant grows rapidly, affording good feeding six weeks after being sown. Sheep are fond of mustard, and it prevents liability to scouring.

In addition to the method of renewing the pasture land which Mr Young pursued, and which we have briefly described, being efficient for the desired object, it was also in itself a profitable operation. The extra feeding which the rape, vetches, &c., afforded more than repaid the cost of the labour and manure which were employed in that work.[1]

Improvement of Hill Pasture.

The improvement of hill pasture and of grazing land which cannot be advantageously put through a course of cropping is a matter of considerable difficulty. In

[1] *Irish Farmers' Gaz.*, Nov. 26, 1881, 467.

all probability the prospects of return would not justify a heavy outlay, and without this it is not easy to effect any marked improvement in the pasture.

Deterioration of Hill Pastures.—It is not surprising that complaints of deterioration in hill pastures should occasionally be heard. By the system of grazing pursued on these, there is a gradual exhaustion of the natural resources of the soil without the slightest compensation from any external source. The repairing and replenishing forces of nature are ever at work, but these are often inadequate to recoup the land for what has been removed from it in the bodies of the animals reared upon it. Deterioration becomes manifest in the pasture, and the farmer is puzzled to know what should be done.

Cropping.—On hill pasture little can be done with advantage in the way of improvement by tilling and cropping the land. In certain cases small portions have been renovated by this method, but the cost is great, and the results rarely satisfactory. The process of renewing the grasses on poor land followed by Mr Young of Brockley Park, Stradbally, Queen's County, Ireland, and described above (p. 292), might be carried out with good results on low-lying permanent pasture which has become deteriorated.

Manuring Hill Pasture.—Many experiments have been tried in the way of manuring worn-out hill pasture with bones and superphosphate. The effect on the pasture has usually been marked; but, as a rule, we believe it is acknowledged that the results are too uncertain to warrant such heavy expenditure, at any rate on an extensive scale. A few patches of specially good pasture, on well-sheltered low-lying parts, are a great advantage on a pastoral farm, and these may profitably have an occasional dressing of artificial manure.

The manuring of hill pasture, however, has never been regularly or extensively practised in this country.

Liming Hill Pasture.—In the improving of hill pasture, lime has been used much more extensively than manures, and the results from the former have, as a rule, been highly satisfactory. It can hardly be expected that it would pay to spread lime upon poor black moory pasture. The attempts at improvement by lime as by manures should be confined to the green land. If the land is wet it must first be drained, either by underground drains, or by open or "sheep" drains (the former are the more effective, and of course also the more expensive), and about a year or so after the draining has been completed, the lime may be spread. A good dressing would be about four to six tons of lime per acre.

Effects of Lime.—The lime has a wonderful effect upon the rough green pasture. It brings up a growth of sweeter, greener, and more juicy grasses than grew there before, so that in a few years the character of the herbage is vastly changed. The sheep soon discover the portion that has been limed, and show by their partiality for it what they think of the "lime-sweetened" pasture. Six months after the application of lime they feed on the land with avidity.

Enduring Effects of Lime.—Moreover, the good influence of lime upon pasture is by no means short-lived. It endures for twenty or thirty years, and has in many cases been visible for even a longer period.

Heather-burning.—By systematic and judicious heather-burning, much may be done to improve black hill pasture. See Divisional vol. iv. p. 437.

Bracken-cutting.—Brackens should be kept in subjection by cutting with the scythe. If they are allowed free growth, they may seriously lessen the supply of pasture. On the other hand, a clump of rank brackens here and there may be an advantage on a hill-farm, on account of the excellent shelter afforded to lambs.

Irrigation.—Hill pasture may be greatly improved by irrigation. In many cases where streams or springs exist this may be carried out with little trouble or expense. Water from running streams is preferable to water immediately from the spring. By a network of shallow runs, the water may be carried over black or partially barren land, which will be thereby much improved for pastoral purposes. This work of irrigation is carried out in spring and early in summer.

A Mid-Lothian Example.

A good example of what may be done in the improvement of hill pasture by

draining and liming without the aid of tillage is to be found on the compact adjoining little estates of Baadpark and East Cairns, Mid-Calder, the property of Mr William Hamilton. These estates lie on the north side of the Pentland Hills, running from 900 to 1800 feet above sea-level. The geological formation is carboniferous sandstone. At a former period portions of the land had been under cultivation, but had been allowed to go back to natural pasture. At the time Mr Hamilton began his improvements even the once-cultivated land was producing coarse herbage of poor feeding quality, while the other portions were in their natural state, growing bent, other coarse grasses, rushes, heather, &c. Most of the lower-lying land was green on the surface, but the pasture was coarse and wiry.

Draining. — The improvements consisted of tile-draining and liming. The drains were cut from 6 to 16 yards apart, and from 3 to 5 feet deep, according to the nature and condition of the land. Two-and-a-half-inch tiles were used for the most part, and Mr Hamilton says that if he had the work to go over again he would be inclined to use 3-inch tiles. The drains have worked admirably, but they, of course, require a little repair now and again.

Liming.—The lime was spread on the surface at the rate of about six tons of shells per acre. The liming of the wet land was delayed about a year after the draining, so as to allow the soil to get rid of its excess of water. Such portions of the green land as were naturally dry were limed without being drained, and on these and on the drained land the lime was equally beneficial.

Cost. — These improvements were begun in 1870, and they have been extended over an area of nearly 300 acres. The draining cost on an average about £5, 10s., and the liming about £4, 4s. per acre.

Results. — The total sum expended was about £1800, and Mr Hamilton considers that the investment has been a good one. By the draining and liming the character of the pasture has been entirely changed. A growth of fine nutritious grasses has come up in place of the coarse wiry herbage which before covered the ground. Even yet patches which were limed eighteen and twenty years ago can be traced by the eye at the distance of a mile. On close examination the difference between the improved and unimproved land is most marked.

The property is entirely under sheep, the stock consisting of blackfaced ewes and lambs. Prior to the improvement of the pasture these were smaller in size and of less value than any other stock in the neighbourhood. They have now been increased 15 per cent in numbers, and at least 20 per cent in value. From 95 to 100 lambs are now reared from every 100 ewes, a considerable number of doubles being obtained. The wedder lambs usually make about the top price at Messrs Oliver & Son's sales at Edinburgh, while the cast ewes run up to 46s. There has also been a substantial increase in the clip of wool, while the death-rate has decreased. The whole of the ewes put to the ram in November 1883 were with one single exception on the roll at clipping-time in the following July.

The blacker and poorer portions of the property were not touched, for it could not be expected that these would repay such heavy outlays as are involved in tile-draining and liming. In certain parts a little has been done with advantage in the way of surface-draining.

We had the pleasure of going over this property quite recently, immediately after a heavy rainfall, and were much delighted with its condition. The drained land was remarkably dry, and the character of the pasture showed unmistakably that a permanent improvement of great value had been effected.

Improvements at Glenbuck.

In his report on "The Improvement of Hill Pasture," in the *Transactions of the Highland and Agricultural Society*,[1] Mr Alexander Macdonald gives the following notes in reference to improvements on hill pasture carried out by Mr Charles Howatson of Glenbuck: "The farm of Glenbuck, Lanarkshire, which carries one of the finest sheep stocks in Scotland, has been vastly improved through liming and draining by its enterprising owner and occupier, Mr Charles Howatson.

[1] Fourth Ser., xix. 170.

Draining.—"The greater part of it has been intersected with tile-drains, most of them 18 feet apart, and others 36 feet. Between each of those 36 feet apart, a shallow tile-drain is sunk, and is found to do good work. The size of the tiles used is 2½ inches, and the open drains, of which there are a great many, are 20 inches wide at the top, 18 inches deep, and 9 inches wide at the bottom. The cost of laying the tile-drains 18 feet apart and at the ordinary depth was about £9 per acre. Mr Howatson recommends in cutting open drains that all stones or tree roots which may impede the spade should be extracted, and the earth taken out removed 3 feet off the side of the drain.

Liming.—"Lime has been applied to the pastures at various times, costing as a rule 50s. per acre. By this system of top-dressing the character of the pasture has been materially enriched and improved, and parts of it which were limed some thirty years ago are still green and vigorous, while the adjoining land that got no lime is perfectly bleak and sterile.

Breaking up Unsuccessful.—"With a view to compare the results of an experiment in breaking up hill pasture, in trying to improve it, with the liming and draining of it without breaking it up, Mr Howatson trenched 2½ acres, gave it two tons of bone-manure, and sowed it down with grasses and clover, but it is not likely to prove successful. It cost nearly £17 per acre. Mr Howatson finds that ploughing, before top-dressing hill pasture, is no advantage whatever, while it incurs considerable expense."

TRENCH AND SUBSOIL PLOUGHING.

When Mr Smith of Deanston, by his example and precept, had put the drainage of land on a systematic basis, he turned his attention to the deepening of the staple of the soil. This he found could be effected by trench-ploughing or by subsoiling, it altogether depending upon the character of the soil which of these operations would be most suitable.

Trench-ploughing.—Trench-ploughing can be done in two ways. It may be done by one plough drawn by three or more horses taking an extra deep furrow, or by one plough following another in the same furrow. The latter method enables the farmer to take up an inch or two of the subsoil for mixing with the upper soil.

Injurious Ingredients in Subsoil.—But in deciding to carry out this process of taking up subsoil, to be mixed with the surface-soil, great care must be exercised. The subsoil often contains substances that are deleterious to plant-growth, and if these are brought up the soil may for a time be seriously deteriorated.

Subsoiling.—The use of the subsoil-plough is the safer practice. By it the subsoil, without being taken to the surface, is stirred or broken up, which allows water and air to percolate through the soil, thus dissipating the injurious elements and improving the whole character of the land. Subsoiling also increases the beneficial action of drains. Air, when it enters a soil, raises the temperature, renders the dormant ingredients active or soluble; and, lastly, the operation of subsoiling increases the area for the ramification of the roots of plants.

Subsoiling can be best done when ploughing the fallow, and ought never to be attempted until the soil is perfectly dry. The subsoil ought to be broken up and not cut, which would be the case if the operation were carried out while the land is wet. The subsoiling ought to be done across the line of the drain, especially if the subsoil contains any of the numerous forms of "pan," which can be more readily broken up by following this method. It also helps the drains, as it forms ruts to each drain for the water to run in.

Trench-ploughing following Subsoiling.—After this subsoiling the land may be safely trench-ploughed when it comes next into fallow, as all the deleterious substances will have been either

washed out of the soil or rendered insoluble by the action of oxygen or other elements.

Subsoil-plough.—Various implements have been devised to descend as far into the soil as to stir the subsoil effectually, and they have obtained the name of *subsoil* and *trench* ploughs, according to their action upon the subsoil. The subsoil-ploughs stir the subsoil lying under the upper soil, without affecting their relative positions, whereas trench-ploughs commingle more or less the subsoil with the upper soil. The working of the subsoil-plough is shown in fig. 46, p. 119, and fig. 47, p. 120, Divisional vol. i.

Economy of Trenching and Subsoiling.—One great advantage attending this mode of trenching and subsoiling is, that in thus stirring the soil in autumn the upper soil requires only to be stirred in spring by a grubber to effectually pulverise the surface and prepare it for a green crop. When a facility is put into the power of the farmer to work his land in a short time and in the most efficient manner, two good results must ensue—the entire fallow-break may be devoted to a green crop, and a smaller horse-power will suffice for the work.

Process of Trenching and Subsoiling.—The execution of subsoil trenching with the trench-plough and subsoiler is as follows: The trench-plough, drawn by three horses, takes the lead and lays open a furrow of 10 to 14 inches deep, according to the character of the soil. When a large stone is encountered, the horses are not urged, but taught to stand still until the ploughman marks its spot. He passes the stone the best way he can, and goes on with the ploughing until he meets with another stone. Two labourers follow the plough, one with a spade and another with a hand-pick or crowbar, to turn out the stone upon the ploughed land.

The subsoil trench-plough, provided with four horses, the extra ploughman walking beside the foremost pair, follows in the same furrow, and goes 6 or 7 inches deeper into the subsoil. Should a stone be encountered, the extra ploughman marks it, and he also helps to turn the horses at the end of the landing.

These horses are also taught to stand when coming against a stone. A reckless practice too common is to urge the horses on when encountering a stone, running the risk of breaking the plough, straining the horses, and snapping asunder some part of the harness. The two labourers are at hand to bring up the deeper stone to the ploughed surface.

An acre is stirred every day with these two ploughs in autumn; the horses are not oppressed, the men are quite able for their part of the work, and the work done is effectual, satisfactory, and permanent.

Perhaps a better plan in medium land is to start the plough with two horses, and let the man have pegs to mark the stones, the subsoil-plough following with three horses. The land-fast stones can be removed then at the convenience of the farmer.

Such a subsoiling is sufficient for a lease of nineteen years, and even longer. The stones which can be lifted by hand are carted off the surface. Some boulders may require blasting with gunpowder on the spot, and others have to be drawn off on a sled.

This operation is most effective a few years *after* thorough drainage. The subsoil *trenching* is not required in a naturally porous subsoil, but *deep* stirring of the surface-soil is a necessity on every class of land.

Hand Trenching.—Trenching with the fork is more efficient than ordinary subsoil-ploughing as regards the stirring of the soil and subsoil. It is also a more perfect operation, inasmuch as it exposes the subsoil to view, breaks every portion of it to a greater depth, and frees it of every stone that, from its size, would injure the implements in any future operation of culture. The cost, however, is great, and the process a slow one.

"In digging light soil, or any soil in a friable state, the spade should be driven to the head into the ground by one pressure of the foot, and thus twenty cuts may be made in one minute. In Ireland one perch of soil is dug 9 inches deep, at the same cost that half a perch of drain, 2½ feet deep, is cast out; but more wages should be obtained for casting drains than digging soil, to provide against the extra tear and wear of shoes and clothes, and the risk of injuring health by cold and wet. The most economical way of digging a large piece

of land is to set from twenty to thirty diggers at work together, at so much for one acre, and place a confidential man over them to see that every spadeful is properly formed and turned over."[1] A spit by a common spade No. 5, weighing 8 or 9 lb., should be 7 or 8 inches broad, 9 inches deep; and the earth weighs 17 lb. In digging one perch of ground, the spade has to be thrust in 700 times, and 11,900 lb. of earth is lifted. To dig one acre takes 112,000 spadefuls, weighing 850 tons, and adding the weight of the spades, 1278 tons: the space travelled over in doing this is fourteen miles. An able man can dig 10 square perches in one day, provided the soil is light and moderately moist.

LIMING LAND.

Lime has been applied to land in the farming of this country for many years. This has been done with the double object of increasing crops and stimulating the action of the ingredients of which the soil is composed.

Sources of Lime.—Lime, or, to be more definite, "oxide of calcium" is met with in nature chiefly in the form of the compound carbonate of lime, otherwise known as limestone, chalk, &c., also as phosphate of lime or coprolites, sulphate of lime or gypsum. It is likewise present under other forms; but the preceding are the compounds, of which lime forms a part, that fall to be considered from an agricultural point of view.

Action of Lime.—Lime when applied to the soil acts in several ways, both chemically and mechanically. When the carbonic acid and water are driven off by heat it becomes a strong alkaline earth, and in this caustic state combines with the oxygen and carbonic acid set free by the decomposition of organic bodies present in the soil. The decay of organic matter is thereby quickened. It also breaks up the compounds of inorganic matter which have become dormant or insoluble, and by combining with the elements of which these are made up, renders them active or soluble in water, and so available for plant-food. It combines with and neutralises or utilises free or injurious acids which are present in a soil, and which render it sour, thereby changing its character, and making it sweet and mellow. It is, moreover, itself also a direct plant-food.

Lime acts mechanically inasmuch as it changes the texture of a soil, opening and rendering more friable stiff loams and heavy clays, and giving cohesion and firmness to loose and sandy soils.

Benefits from Lime.—The result of these changes effected by the use of lime are an increase of produce, grain of better quality and colour, stiffened straw, sweetened herbage, and an earlier harvest. Lime often almost entirely changes the herbage of pasture-land, notably when applied to rough grass or heath, which it kills out to make room for a higher order of vegetable growth.

Injury from Imprudent Liming.—But there are disadvantages attendant upon the too free use of lime. By its action we must look upon it as a stimulant rather than as a manure. Indeed, if it were regularly applied to land without other manures, the soil would soon become exhausted. This well-established character of lime has been aptly expressed in the saying that "lime without mulch enriches the father and impoverishes the son."

Application of Lime.—Before green crops found a permanent place in the rotation of the farm, the most convenient time for applying lime was to the bare or summer fallow in spring. It is now generally applied to the leas in autumn or winter before they are broken up. In some counties the custom is to spread it on the land after the turnip crop has been removed. Others spread the lime when the land is being prepared for the turnip seed, or in small heaps immediately after

[1] Yule's *Spade Husb.*, 86, 2d ed.

the turnips are sown, and consider that the after-cultivation of the crops will mix the lime with the soil. These three methods, however, are objectionable, as by placing the lime into such close contact with the manure, the latter may be seriously dissipated.

Lime Dissipating Plant-food.—Caustic or quick lime applied in excess to newly manured land is apt to liberate a greater quantity of the most valuable ingredients of the food of the plants than the crop can immediately absorb. On this account much plant-food may be lost by being washed into the drains, or evaporated in the form of ammonia or other volatile gases.

Lime and Nitrification.—Lime, says Professor Wrightson, "is the base required in the process of nitrification,[1] to seize upon newly liberated nitric acid. The nitrification of nitrogenous matter existing in a state of organic combination is one of the most recent, and one of the most important facts brought out by agricultural chemistry. Lime plays an important part in this process, by promoting the oxidation of nitrogenous matter, and then furnishing a base for combination with nascent nitric acid. Nitrate of lime is easily washed through the soil, and a great deal of it passes away in solution to the lower strata of the soil, or is discharged by drain water."[2]

Lime and Soil Nitrogen.—It is a common practice, and a prudent one, to apply lime to land which has been for a considerable time under grass, and which is now to be broken up for cropping. This is done for the purpose of rendering available to the first crop a portion of the inert nitrogen that has, under the grass, accumulated in the soil in the form of organic matter. Here again, however, harm may be done by excessive liming. The danger of this is well pointed out by M. H. Joulie, who says:—

"Lime ought only to be employed in moderation, so as not to overstep the mark, and so bring about too active a nitrification, which would cause the grain crops to be *laid*, and prodigally waste the nitrogenous materials which are accumulated in the soil.

"These reserves are precious, and if, on the one hand, it is useful to draw upon them, it would be a very short-sighted policy to waste them recklessly. As the most luxuriant vegetation can only absorb annually a small quantity of nitrogen, it is important to introduce lime only in such proportions as to render assimilable the quantity of nitrogen necessary for the growing crop.

Guided by the Crop.—"One must be guided in this matter by the appearance of the crop. If scant of growth, and of poor colour, the quantity of lime should be increased. On the other hand, it should be diminished if the growth is too quick, the colour too deep, the ripening difficult, and the laying of the crops frequent.

Regulating Action of Lime.—"When the soil is rich in lime, the employment of lime is not only useless, but will be positively prejudicial for the reasons I have given. In such a case the difficulty will be to regulate the action of the lime, which the plough brings up and mixes with the superficial nitrogenous layers. The most simple means of effecting this is to gradually mix the superficial humus-holding layer with the subjacent lime by shallow ploughing at first, and subsequently ploughing deeper and deeper. But since good cultivation demands a soil deeply stirred, the plough may be followed by a subsoiler, so that the soil may be stirred to a suitable depth."[3]

Lime for Sandy Soils.—The late Dr Voelcker showed clearly the importance of liming poor land before dressing it with dung or other manure.[4] "The most liberal application," he says, "of farmyard manure of the best quality never produces so beneficial and lasting an effect on poor sandy soils as when they have been previously well marled or limed. There are some soils which swallow up manure with, so to speak, an insatiable appetite, without ever feeling the better

[1] For description of the process of nitrification, see Div. vol. iii. 105.

[2] *Prin. of Ag. Prac.*, 34.

[3] From a paper read at a meeting of the Société des Agriculteurs de France, 1881. *Jour. Roy. Agric. Soc. Eng.*, sec. ser., xviii., part i. 221.

[4] *Jour. Roy. Agric. Soc. Eng.*, sec. ser., xiv., part ii. 546, 547.

for the manure—they are appropriately called very hungry. On all such soils much manure is wasted, or the most is not made of it, if previously to the application of farmyard manure, guano, &c., the land has not received a good dose of lime. . . .

"Lime not merely acts beneficially on sandy soils in a direct manner, by supplying a deficient element of nutrition, but also because it preserves in the soil the more valuable fertilising matters, which, like salts of potash or ammonia, rapidly filter through sandy soils, unless a sufficient quantity of marl or lime has been previously applied to the land. By these means the bases of the more valuable saline constituents of rotten dung or of guano are retained in the land, whilst the acids filter through it in combination with lime—a constituent which is, comparatively speaking, inexpensive.

Lime and Soluble Phosphates.—"The presence of much or little lime in a soil has also a powerful influence on the changes which soluble phosphates, or manures containing soluble phosphates, undergo in contact with the soil. It is a curious, and apparently anomalous circumstance, that on sandy soils, and on all soils deficient in lime, concentrated superphosphates, rich in soluble phosphate, do not produce nearly so beneficial an effect upon root-crops as upon calcareous soils, or upon soils containing even a moderate proportion of lime.

"When applied to root-crops upon sandy soils greatly deficient in lime, a concentrated superphosphate produces a smaller crop than a manure containing only one-fourth the percentage of soluble phosphate. When this fact was first brought under my notice I ascribed it to prejudice, or accidental and unobserved circumstances; but direct experiments and an extended personal experience have shown me that there is no mistake about this matter. The true explanation no doubt is, that the excess of acid soluble phosphate in a concentrated superphosphate is not precipitated as efficiently in a soil deficient in lime as it is in land containing a good deal of lime.

"Acid compounds are extremely injurious to vegetation, even in dilute solutions; and hence concentrated superphosphates used in large quantities, say at the rate of 5 to 6 cwt. per acre, do positive injury to root-crops, and more moderate applications of 2 or 3 cwt. per acre produce a less favourable result on sandy soils, and on all land poor in lime, than the same amount of superphosphate poor in soluble phosphate. Indeed, the experience of light-land farmers in districts in England where the land is deficient in lime goes to prove that on land of that description it is better to apply bone-dust or precipitated phosphate, or phosphatic manures containing no soluble phosphate, to root-crops, than to use superphosphate, or similar artificial manures containing a large proportion of acid soluble phosphate of lime."

Lime for Grass Land.—M. H. Joulie shows that lime should play an important part in laying land down to grass. "If on analysis," he says, "the soil does not show at least 5 per cent of lime, it is absolutely necessary to give it a calcareous dressing before laying down to grass. This may be done either with marl or lime. Marl breaks up slowly, and its mixture with arable soil only takes place, little by little, under the influence of repeated ploughings, so that it is not suitable in the special case before us [laying land to grass], as the soil will not be ploughed up again. Lime is infinitely to be preferred, since it readily breaks up, and has, moreover, a much more powerful action on organic matter than marl, due to the causticity which it retains sufficiently long to allow it to effect some useful reactions."[1]

Top-dressing Grass with Lime.—In the paper referred to above, M. H. Joulie explains the exhaustion that takes place annually by the removal of a hay crop, or by the pasturing of grass land, and discusses the manurial dressings that would be required to repair this exhaustion and maintain the quantity and quality of the produce. Lime is an essential ingredient in these manurial dressings, not only because it is necessary as a plant-food itself, but because it is required to remove the sourness that has been generated by the continued accumulation of *débris* in the upper layers of the soil carrying the grass.

[1] *Jour. Roy. Agric. Soc. Eng.*, sec. ser., xviii., part i. 203.

"It is always well," says M. H. Joulie, "to dress the soil of temporary and permanent grass lands with a certain amount of lime, say about 7.96 cwt. per acre annually, to prevent sourness, to favour the decomposition of the organic *débris*, and to render assimilable a certain amount of the nitrogen it contains. This dressing of lime will not add to the expense of maintenance, for it will always be possible by its means to reduce proportionately the expense of nitrogen or potash, according as the Graminaceæ or Leguminosæ are most abundant. Lime is useful even for permanent grass lands on calcareous soils, for it is not rare to find meadows sour on the surface which at 7 or 8 inches deep are highly calcareous."

This annual top-dressing of lime M. Joulie says should be applied to the grass land in autumn.

Lime in Restoring Grass Land.—In the restoring of grass land which has become deteriorated, M. Joulie states that the very first step should be to apply in the autumn about 16 cwt. of lime per acre. This, he says, should be done in order to render a sufficient quantity of the nitrogen in the soil assimilable by the ensuing spring, when the application of other mineral manures is advised.

Lime for Hill Pasture.—In the notes on improving hill pasture in this vol. (pp. 292-295) information is given as to the application of lime to permanent pasture on sheep farms, and also as to its effects on herbage.

Burning Lime.—For use on land as for mortar, lime is burned in kilns, and conveyed to the farm or field in shells. Many farmers who have limestone within reach burn their own lime, using peat if it is to be had, and, if not, purchasing coal for the purpose.

Ground Lime.—The plan of grinding the limestone to a fine powder instead of burning it has been introduced and is highly commended, but has not yet been adopted to any great extent.

Spreading Lime.—The lime is spread in this manner: Frying-pan shovels are the best implements for filling carts with lime, and spreading it upon land. A calm day is chosen for the purpose; but in case of a slight breeze, the single-horse carts are placed to the windward of the heaps when being filled. Slaked lime is heavy; but all that can lie upon a shovel is light, and each ploughman takes one heap, and with one of his horses in a cart, for a yoking, fills his own cart, and spreads the lime from it upon the ridges allotted to him. The direction in liming should be against the wind, and the men should arrange themselves on the ridges so that the cart farthest down the wind takes the lead in spreading.

In spreading lime, the man walks along the middle of the ridge, and casts the shovelfuls right and left from the middle towards the furrows, which will become, by ploughing, the crowns of the future ridges. The man who can cast the shovelfuls with either hand will spread lime better than one who is right or left handed only.

The lime should be spread *evenly over the surface;* but to suit irregularities in the character of the soil, it may have to be spread thicker on one part of the field than another. On light knolls it is spread thinner than in hollows, where the soil is deeper or stronger.

Whenever rain falls, liming should be discontinued.

Care of Men and Horses in Liming.—In the operation of spreading lime it is advisable to put a cloth over the horse's back and harness; while the men should cover their face with crape, to save the eyes, lips, and nose. The horses, whenever loosened from work, should be wisped down and brushed, to free the hair of lime; and if the men feel a smarting in their eyes or nose, sweet thick cream is the best emollient to apply.

Quantity of Lime per Acre.—The quantity of lime applied depends mainly on the nature of the soil, the lighter soils requiring less, and the stronger greater quantities. On light turnip soils, some think from 80 to 100 bushels upon one acre sufficient, whilst others use 150 bushels. We have seen as much as 510 bushels applied to one acre of wheat-land, with manifest advantage. But perhaps from 100 to 200 bushels may be considered average quantities, from the lightest to the heaviest soils. On weak moory soils, 75 bushels are enough to commence its improvement.

Frequent Liming. — Formerly the

prevailing custom was to apply large dressings of lime at long intervals, most likely once in fifteen or twenty years. The general custom now is to give moderate applications at short intervals—perhaps from 80 to 100 bushels every eight, ten, or twelve years. This is unquestionably a marked improvement upon the old plan. It employs the lime much more economically, and the effect upon the land is evener and altogether more satisfactory. Lime has a strong tendency to sink in the soil, and when a large dressing is applied at one time, a good deal of it may be lost by sinking into the subsoil before it has had time to exert its beneficial influence upon the upper stratum.

Many farmers now apply lime once in every rotation of crops. With soils specially requiring the action of lime, this plan is the most effective. As has been explained above, M. H. Joulie recommends the plan of applying a small dressing of lime to grass land every year.

Varieties of Lime.—It must also be remembered that lime varies in strength. In deciding as to the quantity, the strength of the lime, as well as the character and wants of the soil, must be considered. English lime is more caustic than Scotch.

Lime with much magnesia in it is unfit for land.

Covering in Lime.—In view of the tendency of lime to sink in the soil, it is desirable that it should be covered in as lightly as possible. If the lime is applied on lea, as it now usually is, the land should be ploughed with a shallow furrow. If the lime is applied on the fallow or root break after ploughing, a turn of the harrows will suffice for the first covering, and the first furrow thereafter should be shallow.

Weight of Lime.—Lime weighs from 75 lb. to nearly 1 cwt. in a bushel, which indicates that it ought not to be laid on by measure alone, but by measure and weight, giving preference to the lightest weight.

Varying Effects of Lime.—The effects of lime are manifested in a remarkable manner. When ploughed down with an ordinary furrow by itself, no effect is observed on the first crop; when ploughed in deep (which should be avoided), a rotation may pass before it shows any effect; when harrowed in, and the land ribbed for barley after turnips eaten off by sheep, it has effect at once; when ploughed with a light furrow above the dung in summer-fallow (which, however, is in the long-run a wasteful practice), even after the lapse of a few weeks it has a sensible effect on the first crop; it has its best effect on grass of any crop, and most upon clover; it has often an injurious effect upon the potato crop; it loses effect on the same land after several repetitions; it has little effect on soils in the neighbourhood of large towns; it has good effect on fresh soil, on moss that has been thoroughly drained, on all drained soils, and it is wasted upon undrained land. While it is true that lime has a sensible effect on the first crop, when applied above or in close proximity to it, it should be kept in view that, as already pointed out, this is liable to cause loss in the manure.

Effete Lime.—It is the opinion of some farmers that lime is equally efficacious in the soil in the effete as in the caustic state, and Lord Kames was of that opinion; so that the precautions to preserve it in a caustic state in winter are by them deemed unnecessary; but as the general opinion is in favour of quicklime, we have treated the subject accordingly. There is the advantage in using quicklime of its being easily spread upon, ploughed into, and mixed with the soil; and if pulverisation is of use, it should mix with the soil, and act with it more quickly than in an effete state.

Chalking Land.

A top-dressing of *chalk* is given in several districts of England for affording calcareous matter to the soil. It has a striking effect upon fresh-broken-up land; but at length it loses its efficacy. It is applied again when its effect becomes inert.

For this purpose the solid chalk of the lower stratum is preferred to the more porous substance near the surface. It is taken out of pits in lumps, which are put upon the ground to be dressed; and, the lumps being wet, the frost in winter causes them to fall down into a powder, which is then spread over the surface of

the ground. Dry chalk will not fall down, and is therefore useless for the purpose.

Chalk is used in Hampshire to render the soil more loose, and in the wolds of Yorkshire more firm.

The quantities applied vary. In Essex, in the clay-land district, about fifteen cart-loads, of 40 bushels each, are considered a full dressing on one acre. In Lincolnshire, 80 cubic yards of chalk are applied to one acre.

Marling Land.

The composition of *peat shell-marl* of Logie, in Forfarshire—a county which afforded and used so large a quantity of this substance as positively to become detrimental to the soil—is this:—

	From the top of the bed.	From the bottom of the bed.
Carbonate of lime . .	77.6	81.7
Oxide of iron and alumina .	1.8	0.6
Organic matter . . .	14.6	14.6
Insoluble, chiefly silicious matter	6.0	3.1
	100.0	100.0

Shell-marl retards the ripening of corn crops, while lime hastens their maturity. It is not suited to gravelly soil, and its tenacity in rendering and keeping all soils loose for a long time is remarkable.

The process of *marling* as practised in England is similar to that of claying. Marl is a clay containing particles of chalk, which are visible in the mass of clay. The marl is applied both to heavy and light land. On heavy land it is used on newly broken-up pasture, and mixed with farmyard manure in compost. On light soils it is more extensively employed, and its benefits are chiefly derived from an improved texture of the soil.

From 40 to 50 cubic yards are applied on an acre. Its action produces better quality of grain and regularity of crop. Excess of organic matter in a new soil loosens it, which the marling corrects; dry and loose texture of sand is rendered more adhesive and retentive of moisture; and peat is benefited by consolidation and the supply of inorganic matter.

The following analysis may give a fair idea of the composition of a clay marl. The specimen was found in Ayrshire:—

Carbonate of lime . . .	8.4
Oxide of iron and alumina .	2.2
Organic matter . . .	2.8
Clay and silicious matter .	84.9
Water	1.4
	99.7[1]

Limestone.

The lime used in the agriculture of this country is derived chiefly from the mountain-limestone of the carboniferous series, as also from the coal-formation. The rock forms a broad belt across the centre of Scotland, along the centre of England, and in the whole of the centre of Ireland. Lime in Scotland is mostly derived from the coal-formation, where it is associated with shales, sandstones, and ironstones. In Ireland large beds and knolls of limestone nodules, in the form of gravel, are found in many districts. The gravel, when laid upon the land, acts as lime in the course of time; and it affords a very ready means of reclaiming drained bogs, and of reducing their vegetable into earthy matter.

Composition of Limestone.—The composition of some good limestones for agricultural purposes is here given:—

	Carluke.	Cockermouth.	Kilnhead.	Relig.
Carbonate of lime	93.91	94.86	95.89	93.97
Sulphate of lime	0.85	0.23	0.32	..
Phosphate of lime	1.14	..	..	.
Carbonate of magnesia . .	2.06	1.26	0.54	1.32
Alumina and oxide of iron .	1.63	0.73	1.20	1.57
Silica . .	0.41	2.92	2.05	3.14
	100.00	100.00	100.00	100.00

Composition of Lime.—The composition of the limes obtained from the limestones mentioned above, with the exception of Relig, is as follows:—

	Lanarkshire, Carluke.	Cumberland, Cockermouth.	Dumfriesshire. Kilnhead.
Lime . . .	89.78	89.77	88.64
Sulphate of lime (gypsum) . . .	1.45	0.38	0.51
Phosphate of lime .	1.93	..	..
Magnesia . .	1.69	1.02	0.43
Alumina and oxide of iron . . .	2.76	1.23	1.98
Silica in the state of silicate . .	0.70	4.92	3.39
Carbonic acid and moisture . .	1.69	2.68	5.05
	100.00	100.00	100.00[2]

Characteristics of Lime.—The purer lime is, the better it is considered for

[1] Johnston's *Use of Lime in Agric.*, 11.
[2] *Trans. High. Agric. Soc.*, July 1848, 299.

agricultural purposes; it is then said to be in the fattest and strongest state. Of the varieties of limes whose analyses appear above, it would seem to me that the Kilnhead is the best for applying to the land. Plasterers like fat lime, as it runs best and makes the strongest putty. When a considerable proportion of sand occurs, it is the better adapted for common building purposes, as it then requires less sand to convert it into good mortar, and the natural union of silicious matter is much better than any artificial method of adding that can be devised. Of these the Cockermouth is the best for buildings.

Much magnesia in lime is hurtful to vegetation, and is therefore unsuited for the land; but it is a useful ingredient in lime intended for buildings under water, such as piers and docks, where it becomes very hard, and on that account is called hydraulic lime. Of these limes the Carluke would seem best suited for building piers; but the proportion of magnesia in it is but small compared to much of the magnesian lime of England, as at Hartlepool, where it contains about 45 per cent of the carbonate of magnesia, one ton of which affording no less a quantity of the calcined magnesia of the shops than 9⅜ cwt.

Preparing Lime.

Limestone, on being broken into handy lumps, is packed in alternate layers with coal or peat in kilns and burned, when a very material effect is produced upon its appearance and character. From being a close-grained, hard, heavy stone, it is reduced to a porous, light, splintery cinder. One ton of limestone, when thus burned, yields about 11 cwt. of the cinder.

Limeshells. — The cinder is called *limeshells*, and is the state in which lime is taken to the farm. Being light, they are easily carted, though not safe to the skin to handle. The burning has the effect of driving off water and carbonic acid from the limestone; of forming gypsum with the sulphur of the coal, and with the pyrites of the limestone; and silicate of lime with the silicious matter present in the limestone and the coal.

Limeshells have a strong affinity for water. They will extract it from the atmosphere and become in time slaked, which is the end aimed at in putting limeshells on the land in small heaps along the ridges.

Slaking. — They are more properly slaked, however, by water being poured upon them. Pouring water too quickly upon shells causes the lime to be gritty, and to contain many small lumps which refuse to be slaked. The spontaneous slaking is attended with the least trouble as usually practised, but in effect it chills the surface and produces much gritty lime; and it gives sufficient time for much of the powdered lime to absorb carbonic acid from the air, and go back to the state of carbonate and become effete.

To succeed well with the spontaneous mode of slaking, the heaps should be covered with sods, which is a trouble no farmer will undertake with heaps lying on the field. Farmers will willingly cover large heaps of limeshells that are to remain over winter, to be spread upon the land in spring, by which time most of the lime will be found slaked in an excellent state for mixing with the soil.

Lime absorbs about one-fourth of its weight of water; it increases from two and a half to three and a half times its bulk; and the powder has strong caustic and alkaline properties.

Composition of Slaked Lime.—The ultimate results are, that the slaked lime consists partly of caustic lime, partly of carbonate of lime, partly of hydrate of lime, somewhat in these proportions in one ton:—

		Per cent.		Cwt.
Carbonate of lime			57.4	11½
Hydrate of lime	lime	32.4	42.6	8½
	water	10.2		
			100.0	20[1]

Over-liming.

There is no doubt that lime is an exhausting substance for the land. Long ago it was quite common in Scotland for tenants, who grudged to purchase manure, to procure lime and apply it as manure, just as the shell-marl was used, until the land was rendered almost incapable of growing any crop, when it was laid down to grass to rest for a number of years. The various substances of the soil, organic and inorganic, are more rapidly set free

[1] Johnston's *Use of Lime in Agric.*, 44.

after lime has been applied than before; and, on being set free, the roots of plants obtain them the more readily and in greater abundance; and then, as the plants themselves grow more rapidly and to a larger size, and perfect all their parts more completely, they carry off a larger quantity of ingredients from the soil, and if these are not replaced in some way, the soil must become exhausted. If more lime is applied to correct the evil, the exhaustion will become the more severe.

Over-liming was an evil from which the land suffered in a former generation; and when it occurred was confined to poor weak soil, that was soon rendered too loose by the use of the plough. It is therefore so far correct what Johnston says, that "the evil called over-liming is a mechanical, not a chemical one. The extreme openness of the soil has been brought on by prolonged ploughing, and too frequent cropping of corn. An opposite procedure must therefore be adopted, and mechanical means employed, by which a gradual solidification may be effected," among which none is more effective than the eating of turnips by sheep on the land. Where the subsoil is of a nature that it may be taken to the surface without serious injury to the crop, the effects of over-liming may be corrected by deep ploughing, which brings fresh matter from the subsoil, and gives greater body to the land. Now, however, an instance of over-liming is rarely met with. Deficient liming is much more general.

Compost.

A compost of lime and earth is a better top-dressing for grass land than either separately. This compost is usually made too weak in lime. The proportion should be one cubic yard of lime to three cubic yards of earth well mixed. But with labour scarce and dear the making of compost on a large scale would not likely pay the farmer.

The appearance of white clover, *Trifolium repens*, on top-dressing heathy soil with lime, is a well-known fact. Lime extirpates the corn marigold, *Chrysanthemum segetum*, but it encourages the red poppy, *Papaver Rheas;* and on sinking into strong clay it favours the growth of colt's-foot, *Tussilago farfara.*

Gas-lime.

Lime may be obtained from other than natural sources. The rubbish of old buildings afford it an effete state.

Gas-lime is procured from gas-works, and is used as a manure. The use of this substance is noticed in the chapter on Manures and Manuring, Div. vol. iii. p. 120.

IRRIGATION.

The artificial watering of land is an ancient practice. Applied to certain soils and for certain crops it is usually highly beneficial.

Moisture and Vegetation.—It very often happens that the vegetable produce of soils is regulated more by the supply of moisture than by the store of other plant-food. The sterility of the desert is due to the deficiency of water, rather than to the want of soil-food for the plant. Soils, indeed, will not produce vegetation of any kind unless they contain a considerable amount of moisture. Professor Church states that soils which contain no more than 5 to 9 per cent of moisture will yield none of it to the plant. It is well known that under skilful irrigation, or in a moist season, soils which are naturally poor yield wonderfully abundant crops. On the other hand, no amount of manure or inherent fertility in the soil will produce even a moderate crop if the supply of moisture is insufficient.

Reasons for Irrigation.—It is not difficult to understand why moisture is of so much importance to the growth of vegetation. Growing plants usually contain water to the extent of from about 70 to 95 per cent, and the whole of this water has to be absorbed through the soil; for while plants give off a great deal

of moisture through their leaves, they cannot absorb any directly from the atmosphere. It was found at Rothamsted that an acre of wheat in five months and eighteen days evaporated through its leaves no less than 335½ tons of water. And as has been remarked by Professor John Scott, every drop of this water was more or less instrumental in transporting an atom of food from the soil to some part of the plant. Plants indeed can take up their food only in a fluid condition, so that in the economy of plant-life moisture performs a twofold function of the greatest importance.

Professor Church states the reasons for irrigation as follows:—

"1. To make up for the absence of irregular seasonal distribution of rain, or for a local deficiency of rainfall.

"2. Sometimes a particular crop is irrigated because the plant is of an aquatic or semi-aquatic nature.

"3. To encourage early and rapid growth, by warmth of the water, or by the dissolved plant-food which it contains.

"4. That the land may be enriched and its level raised by means of the deposit from the water."[1]

Discussing the subject more fully, Professor Church remarks that the third of these reasons "is the determining cause of nearly all the artificial watering of land in temperate climates. It is not performed because the soil is dry and hot, for it is carried out mainly in the wettest and coldest months of the year. It is not performed because the crop to be raised is of an essentially aquatic nature, for ordinary grasses and meadow herbage are principally watered. But it is performed that growth may be stimulated and fed through certain agencies which the water brings to bear upon the vegetation in question."

Effects on the Soil.—Irrigation facilitates the decomposition of soluble organic and inorganic matter in the soil, and thus prepares food for absorption by the plant. Its immediate effect is to soften the soil, but ultimately land which is submitted to constant irrigation for a long period of time is liable to become injuriously dense and hard. Irrigation may sensibly affect the fertility of a soil by carrying into it atmospheric air and other gases, and organic and inorganic matter held in suspension or solution in the water used for irrigation. In the great majority of cases the influence of this is beneficial, but occasionally substances decidedly injurious to vegetation are introduced. By irrigation plant-food is carried towards the roots of plants, while injurious as well as useful elements are often conveyed beyond the reach of the plants, most probably into the drains.

Irrigation and Soil Temperature.—Irrigation has a direct and immediate influence on the temperature of the soil. In the winter season it will most likely communicate heat to the soil and protect it to some effect from the frost. In warmer weather, by promoting evaporation from the surface, it tends to cool the soil, thus moderating the influence of the extremes of cold and heat.

Irrigation and Drainage.—It is absolutely necessary that land which is to be irrigated shall be thoroughly drained. If the natural drainage is imperfect, the deficiency must be supplied by forming underground drains. Unless the land is well drained, irrigation will most likely be positively injurious, for the soil will be very liable to become water-logged, and therefore sour and unwholesome for plants.

Irrigation Exhausting.—Irrigation exercises a stimulating influence upon the land. It promotes the growth of a greater produce than would otherwise be obtained, thus increasing the drain upon the natural resources of the soil. To the skilful and liberal farmer this is a most useful function. His object is to increase production, and it will be easy to maintain the condition of the land by judicious manuring.

Water-meadow Irrigation.—Discussing the theory of irrigation as applied to meadows, Professor Church says:—

"Although in many cases it is easy to explain the reason why water, artificially applied to land, brings crops or increases the yield, the theory of our ordinary water-meadow irrigation is rather obscure. For we are not dealing in these grass lands with a semi-aquatic plant like rice, nor are we supplying any lack of water in the soil, nor restoring the moisture which

[1] *Ency. Brit.*, 9th ed., art. Irrigation.

a plant cannot retain under a burning sun.

"We irrigate chiefly in the colder and wetter half of the year, and we 'saturate' with water the soil in which are growing such plants as are perfectly content with earth not containing more than one-fifth of its weight of moisture.

"We must look, in fact, to a number of small advantages, and not to any one striking beneficial process, in explaining the aggregate utility of water-meadow irrigation.

"We attribute the usefulness of water-meadow irrigation then to the following causes:—

"1. The temperature of the water being rarely less than 10° Fahr. above freezing, the severity of frost in winter is thus obviated, and the growth, especially of the roots of grasses, is encouraged.

"2. Nourishment or plant-food is actually brought on to the soil, by which it is absorbed and retained, both for the immediate and future use of the vegetation.

"3. Solution and redistribution of the plant-food, already present in the soil, occurs mainly through the solvent action of the carbonic acid gas present in a dissolved state in the irrigation water.

"4. Oxidation of any excess of organic matter in the soil, with consequent production of useful carbonic acid and nitrogen compounds, takes place through the dissolved oxygen in the water, sent on through the soil, where the drainage is good; and

"5. Improvement of the grasses, and especially of the miscellaneous herbage, of the meadows is promoted through the encouragement of some, at least, of the better species, and the extinction or reduction of mosses and of innutritious weeds."

There are several points which should be carefully weighed before deciding to form a water-meadow.

Water-supply.—It must in particular be considered whether there is likely to be a sufficient supply of water in a dry season to irrigate the meadow thoroughly, and if not, it should be abandoned; whether water can be spared for irrigation, without depriving other purposes of its use, as threshing corn and watering live stock in grass-fields—if water can be used in irrigation before it is wanted for, or after it has been used by, the threshing-machine, or for field-watering, a meadow may be formed; and whether you have a right to take as much water from a rivulet, which forms the boundary of the estate in which your farm is situate, as your water-meadow will require—you can use the water of a brook which wholly passes through your farm as you please, provided it be not injured in its quality, nor directed out of its natural channel when it enters the property below; but you cannot appropriate to your particular use more than half the water of a march-burn. If half the water is not sufficient for the purpose of irrigation, you should negotiate with your neighbour for the use of the whole. It would be a pity to allow the water to be useless to both parties because either can legally use only the half. Assuming that there is sufficient water for irrigation, it is better to take it direct from the brook than erect a dam across it; because the nearer the bottom the water is obtained the better it is for irrigation, on account of the sedimentary matter in it; and the more clay and vegetable matter the sediment contains, the richer it is for irrigated plants. These general remarks apply alike to bed-work and catch-work water-meadows.

Advantage of Water-meadows.—In the southern counties of England great advantage is derived from the water-meadows. The irrigation forces up an early growth which is a great boon to the ewes and lambs. Then follows a crop of hay, and after that again a heavy cutting of aftermath. It is within the mark to say that on many of these meadows the produce is doubled by the artificial watering.

Water-meadows for Highland Districts.—Great as are the benefits derivable from water-meadows in the low country, catch-meadows would prove of perhaps still greater advantage to our Highland districts, where hay is the most valuable food for stock in winter that can be raised at such altitudes. That the formation of water-meadows is practicable in all our Highland glens is apparent from these statements of G. Stephens, which we commend to the consideration of such as may betake themselves to hill-farming:—

"Fallaws Meadow, on Sir George Montgomery's large sheep-farm, contain-

ing 15 acres, was enclosed from moorland in 1816, and, by collecting the water from the surrounding sheep-drains, 5 acres are partially irrigated, and the remaining 10 are top-dressed with the manure made from part of the produce which is consumed in winter by the sheep of the farm in a wooden shed near the meadow. By this simple method of improvement, 15 acres of common sheep pasture-land gave the proprietor from 3500 to 4000 stones of hay per annum, averaging 6d. per stone. In that year of drought, 1826, the hay of this meadow was sold from 1s. to 1s. 3d. per stone.

"What an immense advantage to a sheep-farmer! By this simple process of enclosing and cutting a few small feeders and drains, the owner is enabled to provide food for his flock, when his less fortunate neighbours' sheep must either starve or be supplied from the farmyard; but I am afraid there are few sheep-farmers who are so fortunate as to have any hay over and above what is requisite for stock at home. Sir George fed the same number of sheep on the farm as he did before the meadow was cut off and enclosed, and I am fully persuaded that the same improvement might be made on almost every sheep-farm in Tweeddale; for in almost all of them there are situations where 5, 10, or 15 acres might be enclosed and partially irrigated, as in every pastoral district there are numerous rills which might be easily collected, and used to the greatest advantage, at a very trifling expense; so that, instead of being obliged, in snowstorms, to send 50,000 sheep to a milder climate of the south parts of Dumfriesshire, where the owners are obliged to be at the mercy of their neighbours — not to mention the very serious injury the flocks receive by so long and fatiguing a journey—by adopting the above system of improvement a considerable portion of the losses generally sustained would be prevented."[1]

Time for Irrigation.—"As it is impracticable to irrigate meadows in winter in Highland districts, that process should be delayed till every chance of frost has subsided—until May, after which there will still be sufficient time for a crop of natural hay to grow, be cut down, and won, before the departure of summer. Such a meadow is useful in a backward spring for the support of ewes and lambs: and the sheep belonging to Sir George Montgomery would have inevitably perished in the cold and backward spring of 1826 had it not been for the grass afforded by a water-meadow from the middle of April to the beginning of May; after which latter period the meadow was irrigated, and produced nearly 300 stones per acre. The attention of hill-farmers cannot, therefore, be too strongly drawn to the subject of water-meadows. Any attempt to irrigate meadows in such situations in winter, and to pasture them in early spring, would but injure the meadow by means of frost, and at the same time rot the sheep; but sheep may be pastured, if necessary, in perfect safety on dry meadow-land in spring; and the meadow, on being afterwards irrigated, might yield a good crop of hay."[2]

Soils for Irrigation.—Irrigation will, as a rule, give the best results on sandy and gravelly soils. A retentive soil may be injured by irrigation, for instead of percolating through it the water may lodge on the surface, increasing the tendency to sourness, and lowering the soil temperature by excessive evaporation. It is generally recognised that a sandy soil, with a slight admixture of clay, is the best of all soils for irrigation.

Climate and Irrigation.—As would be expected, irrigation is more beneficial in dry than in moist climates. It is useless, may even be injurious, in a wet season. The best results are obtained in a genial climate.

Crops for Irrigation.—Where moisture is deficient, all crops will be benefited by prudent irrigation. For certain crops, however, it may be employed with greater advantage than for others. In the British Isles irrigation is confined almost entirely to meadows; but in other warmer and drier countries it is used largely for other crops upon arable land. Rye-grass and lucerne are especially suitable for artificial watering, while, to a certain extent, turnips and grain crops will—in their earlier stages—in a dry year be benefited by a moderate amount of irrigation.

[1] Stephens's *Prac. Irri.*, 82.

[2] Stephens's *Prac. Irri.*, 82.

Sewage Irrigation.—By means of irrigation applied to meadow-land, the sewage of towns is now, in many cases, turned to excellent purpose. The Edinburgh sewage meadows afford a good example of what may be done in this way. From permanent grass, cut four or five times a-year, a gross yield of nearly 40 tons per acre is obtained per annum; while land sown with Italian rye-grass affords five or six cuttings, and perhaps as much as 60 tons of produce in one year. The grass is used by cowfeeders in Edinburgh, and brings from £20 to £35 a-year per acre.

Systems of Irrigation.

The systems of irrigation best known are bed-work irrigation, catch-work irrigation, sub-irrigation, side-irrigation with open drains, irrigation by pipe and hose, irrigation by surface pipes, flooding or swamp irrigation, warping, sewage irrigation, and irrigation by watering-carts, water-drills, &c.

Bed-work Irrigation.—This system is applied only to grass land that is nearly level on the surface. The ground is laid out in sloping beds or ridges, the ridges varying in width from 10 to 12 feet, according to the nature of the soil and lie of the land. The supply of water is introduced by a main feeder at the highest points, so that by gravitation it may be distributed to all the irrigation channels.

The process of forming water-meadows on the bed-work system is thus described by Sir John Sinclair:—

"The water being carried with a proper fall—that is, with from 1 inch of fall in 20 yards to 1 in 30 yards, according to the weight and velocity of the water above the mouth of the conductor—to the highest part of the meadow, the next object is, to make the conductor large enough to receive all the water that the stream contains if there is land enough to use it. If there is a great fall from the wear or dam (sluice) to where the meadow is to begin, it (the conductor) may be made comparatively deep and narrow; but on nearly level ground it must be made shallower and wider, as it is only near the top of the stream that the water has any draught. It is of no use to make the bottom of the conductor deeper than the feeder will draw the water out of it; neither is it of any use to make the bottom of the feeder any deeper than the last floating gutter (or irrigating channel) will draw it off. . . .

"In forming the master-feeder it will be necessary to ascertain the breadth and depth that will hold all the water that the conductor brings to it, and thence to the end of the feeder, where the last floating gutter goes out. Its breadth should be diminished all the way; and whatever its breadth may be at the beginning, it should end about 2 feet in breadth, where the last floating gutter goes off.

"If the ridges or beds be 10 or 12 yards wide, and about 100 yards long, with 6 or 8 inches of fall, the breadth of the floating gutters should be about 18 inches at the head, or 2 feet, according to the length of the gutter, and about 6 inches at the lower end of the ridge. This diminution of the gutter serves to force the water out over the sides of the beds; and as a part of the water is always going out of the gutter, it is always growing less, and consequently does not require so much room to hold it. The stuff that is taken out of the feeder should be laid smoothly along its sides, with a slope outwardly, and raised about 6 inches above the surface of the ground; and in crossing ridges the hollows must be filled up with superfluous stuff from the high places or out of the drains, so that the top of the banks of the feeder may represent a straight horizontal line, and keep the water above the surface of the ground, which is necessary to make it flow down and over the sides of the floating gutters with proper effect.

"In making the floating gutters, after both sides of one are cut with a spade, by a line, then cut again with a spade down the inside of your lines on both sides, beginning at the head about 5 or 6 inches from your line, so diminishing all the way down to the end, and pointing the edge of your spade so as to make it intersect your outside cut. When both sides are done, the land in the breadth of the gutter will be divided into three strips, the outside of which will be loose, and will turn out whole in triangular furrows, which form the sides of the gutters and keep up the water above the

surface of the ground. After the sides are cut, there will remain a fast strip in the middle, which must be taken out and laid in equal portions on the outsides of the said furrows, or into the lowest places.

"In taking out the fast strip, it is best to leave here and there a piece unremoved, which serves for stops and saves putting in afterwards. These stops will be wanted more or fewer in number, according as there is much or little descent in the floating gutters. When there is nothing left in for stops as above, the defect must be supplied by putting in boards or sods to check and raise the water to the height you want it. Without stops the water would all flow to the lowest end of your work, and there run out too deep; while the higher parts of the meadow would remain dry. Notches are commonly used at first in letting out the water from the feeders and gutters over the beds; but when the sides become older and firmer, it may be made to flow over them.

"The breadth of the beds should not exceed 10 or 12 yards; but if less than 8 yards, it is best, in general, to put two into one, either with the spade or the plough. The length of a division of floating gutters should never exceed 100 yards in the ridges or beds; because, if they are too long, it makes the water more difficult to regulate, and if the stream be fluctuating when the water falls in, the upper parts of the beds will be dry. All floating is the better of a descent, from the crown of the ridge to the furrow, of from 1 inch in a yard to 2 inches. This must be attended to if the land is to be formed into beds with the spade or the plough; but where it is in proper ridges before, they may be taken as they are, be the descent less or greater than as above.

"At the lower end of the meadow, and indeed at the end of every set of beds, there must be a main drain, and betwixt every two gutters there must be a small drain, to receive the water that flows over the beds and carry it into the main drain. These small drains must be parallel with and reverse in their dimensions to the floating gutters, least at the upper and largest at the lowest end; whereas the gutters are largest at the upper end and smallest at the lower. These small drains, if in a dry soil, will do 6 inches wide at the head and 18 inches at their junction with the main drain. The stuff that is taken out of them is always wanted to make up hollows, or to make up the banks of the feeders, to carry them through low places to higher ground; but wherever it is put it must be properly smoothed to let the water flow regularly over it.

"When a meadow is large and the surface not all upon one section, but has high and low places in it, more feeders must be made, and more cross or master drains. Sometimes it happens that a feeder must cross a drain in carrying the water from one eminence to another through a hollow: in this case a trunk must be made with boards of the size of your drain and placed in it, and the feeder carried over it. The trunk must be as much longer than the width of the feeder as will be sufficient to give room for proper banks to the feeder, otherwise the weight of the water will force them out. If the feeder be small and the drain large, it will be cheaper to make the trunk or spout correspond with the size of the feeder, and carry the water over the drain in it. Hatches or sluices (one or more, according to the size of the feeders) are always necessary in the mouths of them, for excluding or admitting the water at pleasure, and also for changing it when the meadow is divided into divisions."

Catch-work Water-meadow.—The catch-work form of water-meadow is well adapted to pastoral farms. It is applicable to an irregular surface of grass; and the irregularity being varied, no description can be given which would have a universal application. "To give exact directions for the formation of catch-work," remarks Stephens, "is beyond the ingenuity of man; for no two pieces of land are precisely alike, which renders it impossible for the irrigator to follow the same plan in one field that he has done in another. Each meadow, therefore, requires a different design, and the construction to be varied according to the nature of the ground and the quality and quantity of the water." It may be useful, however, to describe the system as applied to patches of smooth grass near brooks.

In fig. 676 the ground is supposed to fall from *a* to *d* and from *c* to *u*; and *o p* is a ridge of ground falling from *o* to *p*, from which the ground declines on the right to *q t*, and on the left to *v z*. A main conductor, *a b*, cut at the highest part of the ground, conveys the water down the incline from *a* to *b*, where it is divided into the two feeders *c* and *d*, feeders being channels cut widest at their origin, and coming at their extremities to a point, to impel the water in them to overflow and run to a lower level. In the overflow from *c* to *d* the water finds its way to *e f*, which collects what comes to it as a drain; but it is in its turn a feeder, and disposes of its surplus water down the descent to *g h*, which sends it to *i*, which sends it to *k*, and which lastly sends it to a main drain *u m*. Part of the water finds its way to the drain *n*, which conveys it to the main drain at *m*. In like manner the water issues out of the main conductor *a b* into the sub-conductor *o p*, from which it flows, being a ridge or watershed to the right to the feeders *q*, *r*, *s*, *t*; and to the left to the feeders *v*, *w*, *x*, *y*, and *z*; to all of which feeders *l u* acts as a main drain. From the horizontal position of *c d*, the water

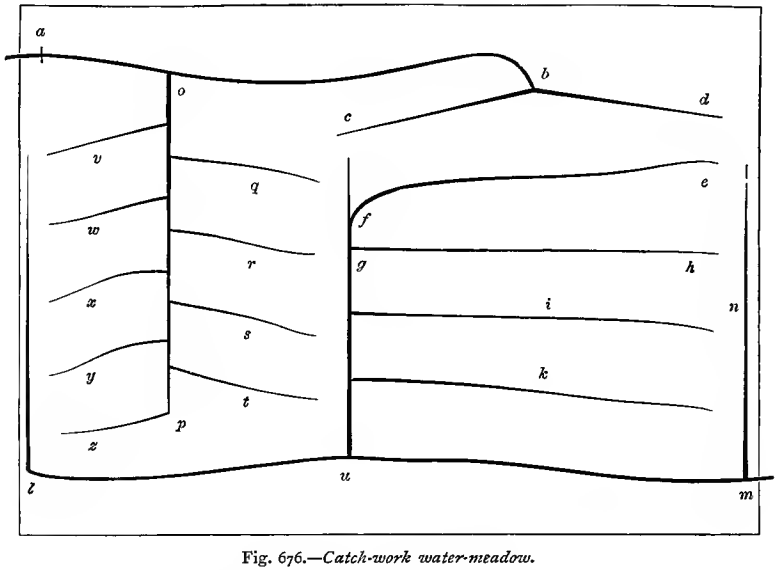


Fig. 676.—*Catch-work water-meadow.*

will impart most of its sedimentary constituents to the ground between it and *f e*, and by the time the water has reached *k*, very little foreign matter will be left in it, so that the grass in the upper part of the meadow will be better nourished than in the lower; but the perpendicular sub-conductor *o p* carrying the water from the main conductor *a b* directly to all the feeders in connection with it, the water bestows equal advantage upon every portion of that part of the meadow. Each feeder may supply water for 30 feet of ground in breadth, if the descent is gradual; but if sudden, the breadth may be increased to 40 feet.

Regulating Water-flow. — Where water flows with unequal velocity, whether in conductors or feeders, *stops* are placed in them to retard the velocity. The stops are made of various materials —of projections of the natural turf left uncut, of pins of wood driven into the middle of the channels, of sods pinned down, of one stone, of stones piled in a heap, and of short boards of wood thrust into the edges of the channels at an angle. But all the stops enumerated are objectionable. Pins collect straws and sticks brought by the water; stones and turfs cause holes in the channels by the water falling unequally over them; and notch-boards injure the edges of the feeders, besides causing deep holes by waterfalls.

The best stop consists of a piece of wood forming two wedges with their bases united, which, when placed firmly at the bottom between the edges of a conductor or feeder, the water flows over in an unbroken mass, with a retarded velocity. A number of such stops of different breadths should be kept to fit any size of channel. No stops are required where the water directly overflows from *b c* and *b d* (fig. 676); but where it is guided from the main conductor *a b* to *o* down the steep sub-conductor *o p*, one stop is requisite at each of the feeders *q*, *r*, *s*, *t*, and *v*, *w*, *x*, *y*, *z*.

Where the ground falls continuously from one patch of grass to another, the water should be conveyed in a lead from the lowest main drain as from *m* of one water-meadow to the main conductor of a lower meadow.

Liquid Manure for Irrigation.—Where there is a scarcity of water, liquid manure may be poured into the main conductor to enrich the irrigation. Many are of opinion that liquid manure gives better results applied in this way than when it is applied directly upon bare soil.

Side-irrigation.—For the system of side-irrigation with open drains, open drains are formed in the field, perhaps from 10 to 12 yards apart. These open drains communicate with drainage canals, into which the irrigation is admitted, and from which it passes into the open drains, where it collects till it rises to the level of the surface or very near it, according to the extent of watering desired. Sluices are then opened in the canal and the water is withdrawn.

Other Methods.—Irrigation by pipe and hose, and by rows of stationary pipes, hardly needs description here, any more than irrigation by the water-cart and water-drill.

Swamp Irrigation is of little value in the United Kingdom, except for growing water-cress.

Warping is not capable of extensive application on the British Islands, yet in certain cases it has been carried out with advantage. It consists of the repeated flooding of low-lying river or tidal land. The object here is not merely to water the land, but also to enrich it, and probably raise its level by allowing the water to deposit the alluvial matter which it has held in suspension. The water to be employed in warping is admitted to the land to be warped by a canal from the sea or river, sluices being provided to regulate the admission and discharge of the water. The land to be treated is hedged in by water-tight banks, to confine the water to the fixed area. Where warping can be carried out effectually, it will most likely enhance the fertility of the land to a remarkable extent.

FARM BUILDINGS.

The equipment of a farm with appropriate buildings is a matter which demands careful consideration as well as the exercise of special knowledge. It is one of those subjects as to which one cannot, in book form, give precise directions suitable for all circumstances. By the perusal of what follows, however, especially by the intelligent study of the plans submitted, landowners or farmers may derive information and ideas which will be useful to them in designing buildings to suit their particular wants and circumstances.

MODERN HOMESTEADS.

For some general notes on modern farm homesteads, as well as for assistance in the general revision of this chapter, we are specially indebted to Mr Gilbert Murray, agent to the Earl of Harrington, Elvaston Castle, Derby. Mr Murray has had much experience in the erection of farm steadings, alike in the tillage and grazing districts of England, and his notes, which are as follows, form a fitting introduction to this chapter.

The Effects of Cheap Transit.—

"The extension of railways in foreign lands, and the vast improvement effected in ocean-going steamers, have placed the produce of distant continents within easy reach of our shores. From New York to Liverpool is a far cry, and yet the swift steamers cover the distance in six days. It is well within the recollection of men now living, that in pro-railway days about the same time was spent by the drovers of fat cattle which during the season weekly travelled by road from the great feeding districts of the north midland counties to the London markets. It is idle to say that population and prosperity have increased by leaps and bounds. The scanty supply of salt beef and mutton has been replaced by a profusion of fresh meat throughout the year. Cheap land and sparse population have enabled the pioneers of civilisation to supply us with their surplus; and this is not confined to live cattle or dead meat. Dairy produce and cereals are largely imported into every seaport of any importance in Great Britain, and prices have receded all round — more particularly in the case of cereals, prices having touched a point at which, under former circumstances, they could not be raised at a profit. In all probability population will sooner or later jibe the heel of production; whether this may be a near or a distant contingency depends on causes beyond human control.

Importance of Suitable Buildings.—"Yet by legitimate combination the owners and occupiers of British soil will hold the field against all comers. Our present task is to suggest a means of aiding in this purpose, and that is by designing and describing a well-equipped homestead, so arranged that the labour of attendance is reduced to the minimum, and where the requisite amount of shelter is furnished at the least possible cost, consistent with economy and stability.

Breeding and Feeding.—"Circumstances alter cases, yet under present conditions the great majority of farms should supply their own requirements in live stock, whether it be cattle, sheep, or horses. We have lately made immense advances in our knowledge of the feeding value of the different products within our reach. This knowledge enables the intelligent and skilful farmer so to blend and balance the various kinds of food as to ensure the most efficient results with the least possible waste. Not only is this object fully attained where the buildings are skilfully arranged, but another important point is likewise attained, and that is the conservancy of the manurial elements contained in the residue.

Mixed Husbandry a Necessity.—"We hear much of small industries and small occupations. The small industries, poultry and fruit, where well managed, contribute to the income of a large occupation. If they do not greatly swell the balance-sheet, they contribute to the comfort and lessen the household expenses, and in the case of poultry prevent waste about the farmyard by picking up the stray corns.

"The craze for the indiscriminate laying down of land to grass has spent its fury and settled down into a more rational state. The future of British agriculture is more than ever dependent on the numbers and quality of its live stock. Intelligent men have now come to fully realise the fact that more stock can be kept on mixed occupations than can be kept where inferior soils are all in grass. An increase of cattle necessitates greater steading accommodation. A considerable portion of the produce of the land is converted into beef, mutton, and wool, and by this means the fertility of the soil is steadily increasing, while more stock are kept, and better crops grown.

Rainfall and Climate.—"The rainfall, elevation, and temperature are factors not to be ignored either in the system of working and stocking the farm, or in the arrangement and construction of the buildings necessary for the occupation of the land. The structural details necessary to withstand the storms common to a maritime district require strength and stability much beyond what is necessary for inland and sheltered localities. Provision has to be made for the reception, conveying, and storage of the rain-water collected from the roofs—in providing for such conservancy the mean rainfall of the district is an important factor in the calculation. A critical and close observer will form a tolerably correct idea as to the different climatic zones by the indica-

tion of the crops and general system of management.

Farmyard Manure. — "The conservancy of farmyard manure is an important consideration in the arrangement and construction of farm buildings. Manure made in open yards surrounded by unspouted buildings is of very inferior quality compared with that made in covered yards. In the latter there is no waste through drainage, and, contrary to popular opinion, the manure is fit to apply to the land at any time. The difference in value between the manure made in open and covered yards is often 50 per cent in favour of the latter.

Economy of Hay and Straw.—"The economical use of hay and straw is another important factor in the financial results of a holding. Very little of either should be fed in a long state; both should be prepared and fed with a mixture of pulped roots and meals. Except under peculiar circumstances, very little straw should be used for litter, for the feeding value of straw is greater than is generally supposed. On most farms spent hops and peat-moss litter should take the place of straw for litter. The very essence of the manure, the liquid part, is fully absorbed by these and retained, and when applied to the land produces an immediate effect.

Warmth and Shelter.—"These are important food economisers, although in the case of store stock they may be easily carried too far. Growing animals require plenty of fresh air. By this means they are hardened, and so to speak acclimatised, and are less affected by a change from the yard to the pasture.

Importance of Position. — "Whenever an entire new homestead is erected care should be taken to select a central position, more particularly in the case of a tillage farm, where the cartage is a matter of considerable import. Roads can be made and the site embellished by judicious planting. A homestead placed on the extreme boundary of a farm entails a heavy tax on the occupier, which continues for generations.

General Arrangement. — "The extent of the homestead is regulated according to area and quality of the land, keeping in view the stock-raising capabilities of the holding. Formerly shedding for 20 head per 100 acres, including the work-horses, was considered the maximum. Now, on good mixed occupations accommodation for double the number is not too much.

"In designing a new homestead the chief point is economy of labour. All the cattle should be fed from the front of the stall, and if practicable should stand in double rows with a feeding passage down the centre, and of sufficient width to allow the passage of a trolly for the conveyance of the food. All the gangways for feeding passages must communicate directly with the food-store or mixing-room.

Barn Machinery.—"The use of fixed barn machinery is now in England matter of ancient history. If the holding is not sufficiently large to warrant the outlay for a portable engine and threshing-machine, the owner of itinerant tackle will be glad to do the work at about the sum it would cost to take the sheaves from the stackyard to the barn. The threshed grain requires at most only once passing through the winnowing-machine to make it fit for market. If it is desired to cut the straw into chaff, a cutter is attached to the tail of the threshing-machine, and the work done at a single operation at the cost of two or three extra hands. Barns are not now necessary except on a small scale, chiefly as a store-room for the threshed grain.

Pastoral Farms.—"These are of two classes, the hill-farms of the north and those on the rich grazing lands of the midland counties of England. The former requires at most only a comfortable residence for the tenant, with a stable and cow-shed on a small scale. On the purely stock farms of the more elevated districts cultivation is seldom attempted. In many cases the tenants of the more extensive sheep-walks are capitalists, occupying and residing on lowland farms; hence all that is required is a dwelling-house for the shepherd and a rude winter shelter for his one or two cows. The home of the shepherd is often many miles from a town or village. With his store of oatmeal, and the scanty produce of his garden and the rich milk of his cows, he leads a happy and contented life.

"On the rich feeding pastures of the south the tenant is almost invariably

resident on the holding. A comfortable dwelling-house is a great inducement to a good tenant, and considerably enhances the value of the farm. In addition to the dwelling-house all the buildings required are a good hackney stable having two loose-boxes and one stall, and shedding for two or three cows for supplying the family wants. On this class of land only a few cattle are wintered, and these chiefly remain outdoors in all weathers. The owners of such land are fortunately circumstanced in that only a small amount of capital is required to provide the necessary buildings.

Dairy and Breeding.—"A farm of this class, if worked on a modern system, requires the most complete equipment of any. The best system of housing dairy cows is in double stalls, 6 feet 6 inches to 7 feet wide, with a feeding passage in front. The best mangers are made of fireclay, in lengths that two will fill the width of the stall. These are glazed inside, and easily cleaned and kept sweet. The division at the head is constructed of 1-inch iron gas-pipes, which pass through the front stall posts. This leaves the shed more airy, and therefore more healthy.

"In the case of milking cows a frequent mistake is made in having the standing too high and too long. The length should be 4 feet from the front of the manger to the outside of the heel-post — a greater length hampers the milker. The standings should be 4 feet high at the shoulder and 3 feet 3 inches at the heel-post, measured to the top of the rail. On well-managed farms the old system of hay-racks has disappeared.

Floors.—"All the beds and floors are laid with well-prepared hydraulic lime concrete, finished off with fine stuff and hatched to prevent the cows from slipping. The beds have a gentle fall to the grip, which never exceeds 4 inches in depth, 20 inches wide, and quadrant-shaped on section, and gradually sloping into the back passage without forming an abrupt angle.

Drains. — "Underground drains are inadmissible in cow-sheds or stables. Where spent hops or moss litter is used, there is no liquid drainage to carry away. Where straw is used for litter, the drainage is conveyed in open channels, and delivered into a trapped drain outside the buildings.

Water-supply.—"All buildings are spouted, and provision made for receiving and storing the rain-water. In well-arranged holdings the water-supply is an important consideration. In hilly districts the farmyard can be supplied at a moderate cost by conveying the water from a higher level into service-tanks which supply the yards and sheds, so that all the animals may have a constant supply at will. It is likewise convenient and useful for flushing the drains and washing out the mangers. For all kinds of stock an abundant supply of pure water is of the utmost importance. Indeed, without a liberal supply of pure water the health of the animals of the farm cannot long be maintained. Purity is an important condition. Soft water is better adapted for the animal requirements, and more conducive to health than hard water. Wherever practicable the homestead should be supplied by gravitation. Where the contour of the country is rolling, there is little difficulty in this. The water can be collected into a surface-reservoir, from which a service-pipe is carried to the homestead, and then distributed as required. Although the water may be originally charged with mineral impurities, the agitation by the wind and the exposure to the atmosphere has the effect of softening and purifying the collected water. Observant veterinary practitioners are familiar with the class of diseases which follow certain geological formations, where the water used for the stock is chiefly drawn from deep wells.

Ventilation and Exercise.—"All sheds should be well lighted and ventilated. A constant circulation of pure air is necessary to health. In the case of young cattle exercise is also essential. In well-sheltered yards a certain amount of exposure is conducive to healthy development.

Stalls and Boxes.—"In the case of dairy cows in milk the tie-up system is the best. For rearing and fattening stock the loose-box or hammel system of the Border counties, combining the covered and open yard, is to be preferred. Not more than eight animals are confined in one hammel. The divisions

throughout should consist of gas-pipes passing through iron standards. This ensures better ventilation; the cattle rest better, and the labour of feeding is reduced to the minimum. The cow-sheds should be well lighted. As a rule, lighting the cow-shed from the roof is objectionable, owing to the danger of breakage, and the difficulty of maintaining the joints in a sound state.

Food-preparing Machinery.—"An important part of a modern homestead is the food-preparing department. This should be easy of access from the outside, and centrally situated as to the rest of the premises. It is essential to economy both of food and labour that a front gangway should be provided to the entire buildings. The food is conveyed from the mixing-house by a trolly or small three-wheel truck, and each animal has its allowance in turn. Before feeding commences, an attendant goes round and sweeps out the mangers where the last feed has not been all eaten up. By this means souring and fermentation is prevented. Every animal should have access to water at will.

Internal Divisions and Ventilation.—"In all cases, with the exception of stables and cow-sheds, the internal divisions should be of gas-pipe passing through oak posts or wrought-iron standards. By this means we obtain a freer circulation of air, which promotes the health of the animal. Much remains to be done to further our knowledge of the chemical nature of the organic impurities of the air. It is now an accepted canon that a large proportion of these organic impurities consists of germs of living organisms. These are frequently the floating germs of disease, which only require a genial host to increase by myriads. Hence it is obvious that our efforts should be carefully directed to perfecting ventilation, and as far as practicable maintaining the purity of the surrounding air.

Cart-horse Stable.—"This is a department that requires great care in designing, for here are lodged the most valuable part of the live stock of the farm. Provision should be made for an ample supply of pure water; allow the animal access to water at all times, and it never drinks to excess. This is my experience both with hard-worked draught-horses and with hunters. On the other hand limit the supply, and they frequently drink to their own injury. For all stables well-laid concrete floors are the best. The fall from front to heel should be very slight. A steep gradient is uncomfortable and injurious to the horses' legs. Under no pretence whatever can underground drains be tolerated in a stable. The drainage is carried in a slightly dished open channel, till it reaches the outside of the building, when it may pass into a well-trapped socket pipe-drain connected with the liquid-manure tank. If straw is used for litter, all the wet portions should be removed daily. If the ventilation is carefully arranged, the horses will be maintained in a healthy and efficient state.

Calves' Shed.—"There are no animals on the farm requiring more attention and more comfortable lodgings than the young stock. Young animals need plenty of exercise in order to encourage the healthy development of bone and muscle. They should not be overcrowded. Weaning calves thrive best in warm well-sheltered yards of a composite character—that is, partly covered and partly open. For litter we prefer peat-moss to straw, as it absorbs the urine, and is always free from noxious smells. The yards do not require cleaning out oftener than once in six months. The buildings should be furnished with rain-water conductors emptying into underground drains as already described. The calf yards are divided by iron gas-pipes. The young animals thrive much better than when isolated and confined in small pens from which they cannot see around them.

General Principles.—"In all cases we prefer covered or partly covered yards to open yards, and except in the case of dairy cows, stock thrive best when kept loose in the yards. If dairy cows were not tied up there would be loss of time and inconvenience in milking. In the use of large quantities of straw under the old system of open yards, a great loss of manurial constituents was entailed through excessive fermentation. Loose straw, when mixed with urine or water, gives off ammonia as soon as it reaches

a temperature of 170°, and thus the essence of the manure is dissipated and lost.

"Good buildings, well arranged and centrally situated, on an ordinary mixed occupation, are seldom appraised at their full value. Nevertheless the suitability or unsuitability of the buildings may add or detract from the yearly rental value of the land not less than from 5s. to 7s. 6d. per acre over the entire occupation."

GENERAL PRINCIPLES.

Before submitting detailed plans it will be well to glance at one or two important points of a preliminary and general character. Chief amongst these are—(1) the designing of buildings to suit the extent of the holding and the purposes for which it is employed or best adapted; (2) the situation of the buildings; and (3) the principles upon which the various compartments should be grouped.

Farms and Steadings.

Different Classes of Farms.—With the almost infinite variety in the character and management of the agricultural holdings of the British Isles, it follows that there must be great variation in the design of the farm buildings. The purposes for which the farm is employed or is best adapted in the main determine the general principles of the design, the details varying with climate, local custom, and individual fancy. The general design having been decided upon, the capacity of the steading is adapted to the extent of the holding.

The main classes of farms are pastoral farms for cattle or sheep or both, purely arable or carse farms, mixed husbandry farms, dairy farms, and suburban farms. Of these systems there are many modifications. Indeed, in certain parts of the country the one runs into the other so gradually that it is difficult to say where the line should be drawn. There is thus ample scope for ingenuity and carefulness in the designing of buildings to suit each individual holding or group of holdings.

The nature of the accommodation required by the different holdings will be discussed in detail in describing the plans to be submitted presently. Here it will suffice to say that while the outlay on buildings should be kept as moderate as possible consistent with efficiency, it is very important that the capacity of the steading should be amply sufficient for the requirements of the holding. The best results cannot be looked for from any holding unless it is provided with sufficient house accommodation.

Burden of Costly Buildings.—It is assuredly of the utmost importance that farms of all classes should be equipped with appropriate and comfortable buildings. It is, however, equally desirable that a careful eye should be kept upon the outlay. To burden poor land with costly buildings is unwise policy. The substantial farm steadings of Scotland have long been the pride of that country. With their cold northern climate the farms of Scotland must be provided with houses that are both substantial and comfortable. Yet there is little doubt that in many cases more money has been sunk in farm buildings in Scotland than was absolutely necessary or was justified by the character and extent of the holdings. And it should be borne in mind that any outlay beyond the actual requirements of the farm is even worse than the actual sinking of so much money. It stands there as an incubus upon the holding, adding to the original burden by occasional repairs.

There is much to be said in favour of the custom which has been so prevalent in Scotland of building farm steadings in a form so substantial as to endure for several generations. Landowners who can thus equip their properties without borrowing money to do so are no doubt well justified in taking this course. But the prudence of the custom may be questioned when the money to construct these costly buildings has to be borrowed, and the farm thus burdened with a heavy tax in the shape of the high interest charged upon such loans. In this case would it not be wiser policy to build cheaper houses, even if they should also be shorter lived? Let it be remembered that any additional outlay incurred to provide extra substantiality not only imparts no corresponding benefit to the holding at the present time, but is actually to the

full extent of the annual charge for that additional outlay an absolute and unnecessary burden. With these considerations in view, the prudent course will be to spend no more money in buildings than is necessary to provide the required accommodation, with reasonable comfort, the maximum of labour-saving convenience, and economical substantiality.

Situation of the Steading.

The situation of a steading is a point which demands most careful consideration.

Were theory alone to determine the site of the steading, it would be at the centre of the holding.

Difficulties, however, of a physical nature often interfere with the choice of the centre as the site. The centre may be very much elevated above the other parts, or it may be a low marsh or a lake. In either case, the steading cannot be placed in the centre of the farm.

When the farm contains both permanent pastoral and low arable land, the steading should be placed as near as practicable to the centre of the arable portion, whether that be the centre of the farm or not.

Water-supply.—Command of water-power is a strong incentive to place the steading by the side of a river or stream. But it is worthy of consideration at first, whether the river or stream is capable of affording a constant supply of water throughout all the seasons. If it is, then the steading may be economically placed near it, though that may not be at the centre of the farm; but if the water be deficient in quantity, if it affords a sufficiency only in winter, then it is more economical to place the steading near the centre of the farm, and erect steam-power there. If it should be inconvenient to place the steading close to the water-supply, it may be possible to select a site to which the water may be diverted.

One essential consideration should be given to all sites, which is, whether pump-water is obtainable or not. Where it is abundant, some inconvenience may be submitted to; but if scanty, the most eligible site ought to be abandoned at once.

Roads.—A good road to a market town or railway station is a natural inducement to place the steading beside it. But this advantage, natural as it is, may be purchased by the sacrifice of a greater. Should the steading be placed, in consequence, at the extreme angle of the farm, such a sacrifice would be made. We know a large steading which is thus inconveniently placed for the sake of a good road and the command of water-power; but these advantages were obtained at the additional expense of maintaining a man and pair of horses, with their implements, to work the most distant fields of the farm. Better make a good farm-road to the turnpike from the centre of a farm, and erect steam-power, than place a steading at its utmost corner.

Shelter.—Good shelter induces the placing of a steading in it. A warm and comfortable situation in winter conduces much to the wellbeing of the stock lodged in a steading. But this desideratum alone should not induce the placing of a steading at a point whence the farm would have to be worked at increased cost.

View.—A pleasant view from the farmhouse may naturally induce the placing of a steading a short distance away from the centre of a farm. It is desirable that the farmhouse should be situated so as to command a view of the fields of the farm, and also be near the steading; and if any sacrifice of position on the part of either is necessary, the house should give way to the steading.

Sites to Avoid.—There are particular spots which should be avoided as sites for steadings. A rocky knoll presents difficulties in making a foundation for buildings, and it is unsuited to proper drainage from a steading. Close to a river or lake, on a level with its banks, renders drainage from a steading impracticable, and such a site should be avoided on account of dampness. A bed of dry loose sand is unsuitable for a secure foundation to a steading, though the difficulty might be overcome by artificial means. A clayey substratum in front of a rising ground is not an eligible position for the site of a steading, inasmuch as it will always retain dampness, whatever may be the

drainage. A very exposed spot in a gap between two hills is an uncomfortable position for a steading, both for man and beast.

Sites on Sloping Farms. — It is a question whether it is more economical to place the steading at the higher or lower part of an inclining arable farm. If situate at the higher part, all the produce of grain, turnips, and potatoes has to be carried up-hill; and if on the lower, the manure is subject to the same inconvenience. Where the surface of a farm forms a round-backed ridge sloping both ways, the apex of the ridge is the most economical site for the steading, and the case is the same when the steading is placed in the centre of a long slope of land. It should not be forgotten that loads have to be carried both to and from a steading, so that the high or low position will answer, provided there be no steep ascent or descent immediately at the steading. When both high and low situations are equally circumstanced, reason and experience would prefer the low.

Having thus pointed out the best position for the steading to occupy on a farm, our next endeavour shall be to explain some general principles which should guide the construction of steadings for every variety of arable husbandry.

Principles of Arrangement.

There are certain principles which, it seems to us, might be followed with advantage in arranging or grouping the various compartments in almost all classes of farm steadings.

Briefly stated, these general principles are: That straw, being the most bulky article in a steading in winter, should be placed at its centre, as the point most accessible to every apartment; that the apartments required for each sort of work in the steading should be placed next each other, as it were in groups, to avoid crossings when different sorts of work are simultaneously carried on, as are inconveniently experienced in too many existing steadings; that ample accommodation should be afforded to each sort of work to be done; and that the groups of apartments should bear such a relation to each other as to be in strict conformity with the system of agriculture adopted on the farm.

These points demand consideration in detail.

Straw.—Straw is not only the most bulky article in the steading, but is also largely used by all classes of stock, and having, though heavy and unwieldy, to be distributed in every apartment by manual labour, it should, of necessity, be placed centrically, and at the shortest distance from the stock. Bearing in mind the relations of these particulars, it is obvious that they constitute the principle upon which the construction of steadings should be based; and as the centre is the nearest point to the circumference, it is also obvious that the original receptacle for the straw should occupy the central point of the steading. There can be no exception to this rule for every variety of farming where straw is in use. Every apartment occupied by stock should thus encircle the straw-barn. Different classes and ages of stock require different quantities and kinds of straw, so that those which require the most should be placed nearest the straw-barn; and in all cases straw should be carried short distances, and not at all from any other apartment than direct from the straw-barn.

The threshing-machine supplies the straw at once to the straw-barn. That machine should therefore be erected nearest to it. The stackyard supplies the corn direct to the threshing-machine, and should thus be contiguous to it; and as the corn and straw are threshed most easily and quickly in a straight line, it follows that the stackyard, threshing-machine, and straw-barn should be in a straight line; and it also follows that as the straw-barn should be in the centre of the steading, and as the threshing-machine intervenes between it and the stackyard, the stackyard should be placed on the outside of the steading.

Admission of Sunshine.—Another important corollary, as regards the construction of the steading, follows from these premisses. The sun is an important source of warmth, and, in consequence, of comfort to the animals in a steading in the winter season. Every facility should therefore be allowed the sun to enter, and the removal of one obstruc-

tion to the greatest amount of sunshine is, placing the length of the central straw-barn north and south; and in settling this point, the straw-barn, threshing-machine, and stackyard will as a consequence be in a line north and south.

This being the case, the building required to accommodate the threshing-machine, and its accompanying corn-barn, being always two-storeyed, a convenient position for the granaries will be to place them east and west, where they will form a good screen from the north wind.

Here, then, we have fixed a principle in the construction of steadings which is capable of extensive application—namely, that the straw-barn should occupy the centre; that the threshing-machine should be nearest to it and in a line with it; that the stackyard should be near the threshing-machine; and that all three should be in a line north and south.

Live Stock.—It shall now be our endeavour to illustrate this principle in its application to all classes of steadings. Cattle fattening, whether in hammels, boxes, or byres, requiring most straw, should be placed nearest the straw-barn. Younger cattle, being lighter, require less straw, whether for fodder or litter, and should be placed either at a greater distance from the straw-barn than the fattening cattle, or at the same distance on the other side of it.

Horses and cows requiring the least straw, may be placed at the greatest distance from the straw-barn.

The leading principle involved in the above arrangement is comprehensive and simple, and is applicable to almost every size and kind of steading. But indisputably correct as the principle is, it is very seldom adopted in practice; and we may safely assert that, the greater the deviation from it, the less commodious are steadings as habitations for stock in winter.

PLANS OF STEADINGS.

We shall now attempt to describe and illustrate the steadings suitable for the different sorts of farming, and to apply the principles explained above to those in which straw is used.

The plans, in illustration of these principles, are the results of much thought and practical experience in the endeavour to apply them to actual use. In this endeavour, it will be observed that in several of the plans the apartments appropriated to arable culture—such as the work-horse stable, cart-shed—are placed on the one side of the straw-barn, while those devoted to live stock, whether in a dairy, breeding, or feeding farm, are placed on the other side. The plans might be adopted just as they stand, or modified according to circumstances—the arrangements being rather suggestive than imperative. For example, the apartments consigned to the use of the arable part of the farm may be placed on the right or the left of the straw-barn, according to convenience in relation to the fields; and the same transposition may be made as regards the apartments occupied by breeding, feeding, or dairy stock; or any apartment may be larger or smaller, according to the work expected to be done in it.

PASTORAL FARMING.

Simple pastoral farming embraces the breeding and rearing of cattle or of sheep, or of both combined; and that sort of farming, combined with arable culture, devotes itself to the same ends.

Cattle Pastoral Farming.

On a purely pastoral farm on which cattle are bred and reared, the steading required is simply a protection in winter for the cows and young stock, and this being the case, the rule propounded above does not apply to it particularly. The calves are put under protection in winter when the weather is severe, or the ground covered with snow, and supplied with hay and water, or let out to the water to drink every day. Such a steading may be erected in any convenient place, detached or near, as desired, to the farmhouse and herd's house.

Houses for Cattle.—A plan of such a steading is given at fig. 1, Plate I., where it is named "Detached pastoral farm steading for rearing cattle": *a b*, *c d*, each 30 feet long, and 18 feet in

width, are the sheds for the shelter of the stock, and *e*, *f*, *g*, *h* are their respective courts, each 30 feet square. The entrances to both sheds and courts should be 9 feet in width. The entrance to the sheds *i i i i* may be arched overhead if built of stone and lime, or have a flat wooden lintel. The walls should be 8 feet in height above the ground. The roof may consist of trees placed in the breadth across the walls, and covered with broom, whin, fern, or branches of spruce, all of which materials will last several years. But, if desired, the roof may be made of ordinary couples of timber and slated. The courts should be provided with water-troughs, one trough to two courts, an arched opening being made in the common wall at *k k*. Gates are placed at the openings *l l l l*. The completed roof and the flat lintels over the doorways may be seen by the dotted lines of the isometrical perspective over the sheds *a b c d*. The walls may be made of dry stone rubble, toothed or pointed with lime on the outside; or they may be made of wood where timber is plentiful on the estate. But the best and most durable materials are stone and lime, where these can be procured.

Such a plan may be contracted or enlarged according to the wants and extent of the farm, and several may be erected on the same farm at places convenient for the making of hay, to save the carrying of that fodder to a distance. Cows in calf and calves will be well sheltered in such a steading in wet stormy weather, or when snow covers the ground; and even year-olds may be accommodated on an emergency, or on a much-exposed farm. From the dimensions given, it is easy for farmers to estimate the number of cattle, at their respective ages, which could be accommodated in the sheds.

Other Houses.—Besides this accommodation for the breeding stock, a pastoral farm requires a steading for various other purposes. The farmer must have a horse and a vehicle to take him and his family to church and market. One or two work-horses are required to bring corn, provisions, and artificial food to the farm, as well as to carry a carcass to the butcher, and hay to the stacks. The farmer must have a cow or two for his family and those of his herds, and he will also have fowls and pigs.

Such a steading is represented by fig. 2, Plate I. It is most easily and economically erected in a long straight building in which the apartments are conveniently arranged. *a* is the killing-house, which is a necessary apartment in a pastoral steading, for when a beast is taken ill, and not likely to recover, it should be killed: it is 18 feet in width, and 20 feet in length, with a window in front and door at the back; *b* is an out-house in which implements and other articles may be locked up, 18 by 25 feet, with a window and door in front; *c* the gig-house, 18 by 9 feet, with a wide door in front; *d* the riding-horse stable of two stalls, 18 by 12 feet, with a window and door in front; *e* the hay-house, in which the corn-chest may be placed to contain the corn for all the horses, 18 by 15 feet, with a window and door in front; *f* the cart-horse stable, furnished with three stalls, to accommodate a strange horse when it comes, 18 by 18 feet, with a window and door in front; *g* the byre or shippen, 18 feet by 20, with a window and door in front, and four divisions for eight cows, if as many are wanted,—if not, it can be made proportionally smaller; *h* the hen-house, 18 by 8 feet, with a window in front and a door at the back, and a hole with steps leading up to it by the side of the door; and *i* is the cart-shed, 18 by 12 feet, with a 9-feet opening.

The stables and byre, being most in use, are placed at the centre of the building, while the less used apartments are at the outer ends. The hay-house may have internal doors leading into the riding and work stables, but in a small steading such as this it is unnecessary to incur the expense. The walls should be 9 feet above the ground, and the roof made of good couples of wood, and slated. The steading may be placed near the cattle-sheds, fig. 1, or at a distance, as most convenient for both sheds and steading. The dotted lines show the structure of the walls and roof, and the positions and forms of the door and windows.

The farmhouse and cottages for the herds should be near the steading.

The scale for figs. 1 and 2, Plate I., is half an inch to the foot.

The extreme length over walls of fig. 1, Plate I., is 125 feet; the extreme breadth, 51 feet; and the width of the sheds is 18 feet within walls. The length of fig. 2 over walls is 153 feet, and the width of the apartments within walls is 18 feet.

The arrow indicates the direction of north.

Compact Pastoral Steading. — It may be deemed desirable to have the cattle-sheds connected with the steading. Such a plan is represented by fig. 3, Plate I., where it is denominated "Compact pastoral farm steading for rearing cattle," and where the central part of the building is occupied by the cattle-sheds *a b c d*, each 30 feet by 18, with their respective courtyards *e f g h*, each 30 feet square. With the sheds here, the apartments of the steading are not in a straight line, as in the above case, but are thrown into the form of wings, the lower one in the plate being devoted to the operations of the farm, and the upper one to those of the house. The lower wing is occupied by *i*, the riding-horse stable with three stalls, 18 feet by 18, with a window and door in front; *k* the hay-house, 18 feet by 12, in which a large corn-chest for all the horses may be placed, with a door and window in front; *l* the cart-horse stable, 18 feet by 18, furnished with three stalls, and a door and window in front. The hay-house being placed between the two stables, internal doors of communication may be made if desired. The gig-house *m*, 18 feet by 12, with a wide door in front. The litter-house *n*, 18 by 24 feet, is provided with a window and door in front, as well as a door at the back, to allow the litter to be carried either way, as required.

The upper wing contains *o*, the hen-house, 18 feet by 10, with a door in front, and a window and bole with steps at the side. There is another hay-house here at *p*, 18 feet by 10, for the use of the byre *q*, which is 18 feet by 20, furnished with four divisions for two cows in each. Both the hay-house and byre or shippen have a window and door in front. The outhouse *r* is 18 feet by 18, with a window and door in front; *s* the killing-house, 18 feet by 26, with a door and two windows in front, and may be used for other purposes.

The walls are 9 feet in height from the floor, and the dotted lines show the structure of the walls, windows, doors, and roof; the roof being made of wooden couples, and slated.

The extreme length over walls of fig. 3, Plate I., is 164 feet. The length of the upper wing is 91 feet, and that of the lower 91 feet. The width of the sheds and courts over walls is 52 feet. The width of the apartments and sheds within walls is 18 feet.

The scale of fig. 3, Plate I., is in the proportion of three-eighths and a third of an inch to the foot.

The farmhouse and cottages for the herds should be placed near the steading, which should be erected in the most accessible part of the farm.

Sheep Pastoral Farming.

Sheep on pastoral farms are never housed in a steading in winter, although in modern agriculture in the low country they are not unfrequently fed in sheds erected beside the steading. Nevertheless, sheep are at times protected in a certain class of buildings, named *stells*, in the upper pastoral districts.

The construction of these and the providing of other forms of shelter for sheep have been fully discussed in Divisional vol. i. p. 202, and Divisional vol. iii. p. 48.

Pastoral and Arable Farming.

There are many farms which are partly pastoral and partly arable. Most likely the lower-lying land will be under tillage and the higher-lying in pasture. The tenant of a holding of this kind endeavours to have as much arable land as will produce corn for the support of his family and servants and horses, and supply straw and turnips for the use of his stock in winter. Such a farm requires an adequate steading, and such a steading is usually provided with a threshing-machine and straw-barn. Wherever these requisites are available, the principle we advanced at the outset is applicable in the construction of the steading.

Combined Arable and Pastoral Steading.—Fig. 1, Plate II., presents such a steading, where the central part is occupied with the threshing-machine and straw-barn in a line north and south

of a range of building having apartments in the upper wing connected with the operations of the arable part, and in the lower one with the pastoral department of the farm. The corn-barn *a* is 18 feet by 26, with a door at the back to the stackyard, and a window looking into the cattle-court *p*; *b* is the site of the threshing-machine; *c* the chaff-house, 5 feet wide, with an internal door to the straw-barn and a window into the cattle-court *p*; *d* the straw-barn, 18 feet by 21, has four doors, two to cattle-courts, and two outside them, to the stables and byre; *e* the cart-shed, 18 feet by 22, with two port-holes; *f* the gig-house, 18 feet by 9; and *h* the horse-course, 26 feet in diameter. To the right of the central range of buildings are the cattle-sheds *l* and *m*, 18 feet by 30 each, with their respective courts *p* and *q*, 30 feet by 30 each. To the left of the central range are the cattle-sheds *i* and *k*, 18 feet by 30 each, with their respective courts *n* and *o*, 30 feet by 30 each.

In the right wing are these apartments for arable culture: *r* the boiling-house, 18 feet by 7 feet 6 inches, having a door at the back and a window in front; *s* the implement-house, 18 feet by 8, with a door in front; *t* the cart-horse stable, 18 feet by 32, having four stalls and a loose-box, 8 feet wide, with a door and two windows in front; *u* the hay-house, 18 feet by 12, with a door at the back towards the straw-barn *d* for carrying the straw to the cart-horse stable *t*, and a window in front; *v* riding-horse stable, 18 feet by 12, with two stalls and a door and window at the back; and *w* a turnip-store, 18 feet by 12, for the cattle-courts *p* and *q*.

In the left wing are these apartments for the pastoral department of the farm: *b'* the hen-house, 18 feet by 9, with a door in front and a window and bole at the back; *x* an outhouse, 18 feet by 17, with a door and window in front; *y* the killing-house, 18 feet by 18, with a door and window in front; *z* a turnip-store, 18 feet by 18, for the cattle-courts *n* and *o* and cow-byre *a'*, with a door at the back; and the cow-byre *a'*, 18 feet by 18, with a door and window in front. The killing-house is a convenience in all pastoral farms, and here, as it should be, it is situated between apartments not appropriated to any kind of live stock. The cattle courts and sheds may accommodate either breeding-cows and calves, or young stirks and heifers bought from the breeders. The turnip-store *w* may be the gig-house, the gig-house *f* a guano-store, and the turnip-store *z* allotted to any other purpose. Turnip-stores could then be made in front of the walls of the cattle-courts *n o* and *p q* at *b'* and *c'*.

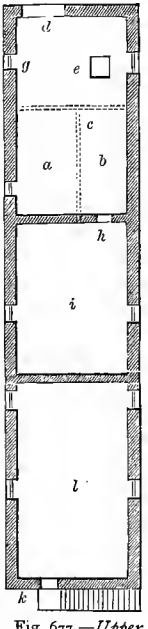


Fig. 677.—*Upper floor of a steading for cattle pastoral farming with arable culture.*

The walls are 9 feet high above the ground, and the dotted lines show the structure of the roofs, the two-storeyed portion of the steading, and the position of the doors and windows.

The highest part of the building contains two floors or storeys. The upper floor or storey consists of the apartments shown in fig. 677, where *a* is the upper barn immediately above the corn-barn; *b* the site of the threshing-machine with its gearing, drum, and shakers; *c* the dotted lines showing the position of the beams of wood which support the threshing-machine; *d* the door, 6 feet wide, which leads into the stackyard, from which the sheaves from the stacks are brought either in wheel-barrows along a gangway, or in carts placed right under the door and forked into the barn; *g* is a window at the right hand of the man who feeds the sheaves into the threshing-mill; *e* is a hatch, 3 feet by 3, communicating with the corn-barn below, for the purpose of passing the roughs of the grain to be re-threshed, where there are no elevators connected with the mill; *h* is a bole, 4 feet by 3½, communicating with the straw-barn *i*, through which the straw is forked, to be again passed through the mill when necessary; *l* is the granary over the cart-shed and gig-house, 18 feet by 32, with an entrance by an outside stone stair *k*, with four windows, two on each side.

The granary is placed here for simplicity of construction, but it would be better to extend the central range into two storeys over the cattle-sheds *k* and *l*, fig. 1, Plate II., and thus have two granaries, each 30 feet in length, with an entrance direct from the corn-barn. In that case, the roof of the cart-shed *e* and gig-house *f* should be brought down to one storey, and the end wall of the straw-barn elevated into a gable.

The extreme length over walls of fig. 1, Plate II., is 188 feet. The length of the right wing is 96 feet, that of the left wing 95 feet. The length of the middle division over walls is 73 feet. The width of the sheds and courts is 53 feet, and that of all the apartments and of the sheds is 18 feet.

The scale of fig. 1, Plate II., is in the proportion of rather more than three-eighths of an inch to the foot. The scale of fig. 677 will be found at fig. 1, Plate II.

The farmhouse and the herd's cottage should be placed near the steading, which should be erected in an accessible part of the farm.

Sheep and Arable Farming.

It is useful and convenient to have some arable husbandry connected with a sheep pastoral farm, as well as with that for the rearing of cattle, and hence a steading is required for it also. As this sort of farming is furnished with stells for the sheep, and does not require courts, the apartments might be placed in a single row; but as such a form would place the apartments at the extreme ends at a considerable distance from one another, it is more convenient to make it into that of a hollow square or parallelogram. Where arable culture is practised, it is advisable to have a threshing-machine, unless itinerant threshing-machines are obtainable.

No courts being required, it is not absolutely necessary to place the straw-barn within the hollow square, although it is necessary to have it at hand; and this is the case in the plan of a "Farm steading, for rearing sheep with arable culture," given in fig. 2, Plate II., showing a slight modification of the principle we have laid down as an axiom, in its application to a case where little straw is required.

The corn-barn is *a*, 18 feet by 32, with a door and window in front. Off the corn-barn is the space *b*, 18 feet by 8 feet 6 inches, for the threshing-machine, as also the space *c*, 5 feet wide, for the chaff-house, with a door to the straw-barn and a window in front. The straw-barn *d* is 18 feet by 40, with a door in front, and another at the back to the stackyard and horse-course, and also a bole at the back. The horse-course *f* is 26 feet in diameter. The killing-house *g* is 18 feet by 10, with a door and window at the back. This apartment is far removed from any occupied by animals. The cart-shed *h*, 18 feet by 18, has two arched ports. The implement-house *p* is 18 feet by 18, with a door and window at the back. All these apartments are situate in the central range of the building.

The two wings are so arranged that the lower one is devoted to the arable work of the farm, and the upper to the pastoral. The lower wing contains the following apartments: the cart-horse stable *i*, 18 feet by 32, having four stalls and a loose-box *k*, 8 feet wide, with a door and window in front; the hay-house *l*, 18 feet by 10, with a door and window in front, as also an internal door leading on the one hand into the cart-horse stable, and, on the other, into the riding-horse stable *m*, 18 feet by 12, with two stalls, and a door and window in front; *n* the gig-house, 18 feet by 10, with a wide door; and *o* the boiling-house, 18 feet by 14, with a door and window in front, and a boiler and furnace at the gable.

The upper wing has these apartments in it: the byre or shippen *q*, 18 feet by 25, contains five divisions, for two cows in each, if required, with a door and window in front; *r* the hen-house, 18 feet by 8, with a door at the back, and a bole and a window in front; *s* the outhouse, 18 feet by 17, with a door and window in front; and the wool-room *t*, 18 feet by 28, with a door and two windows in front, and three windows at the back for air and ventilation, and an internal door to the outhouse for convenience. There is also a fireplace in it at the gable, with a chimney-stalk; *u* is a pump-well shaft, 5 feet in diameter, in the centre of the space common to all the apartments.

The dotted lines show the structure of the building, roofs, doors, windows, and chimney-tops.

The highest part of this steading is the central range which is divided into two floors or storeys. The upper floor consists of three apartments, as shown in fig. 678, where *a* is the upper barn immediately above the corn-barn, and of the same dimensions; *b*, the site of the threshing-machine, with its gearing, drum, and shakers; *c*, in dotted lines, are the beams of wood supporting the threshing-machine; *d*, the door, 6 feet wide, leading to the stackyard, from which the sheaves of the stacks are brought either on wheel-barrows over a gangway, or by carts loaded at the stack,

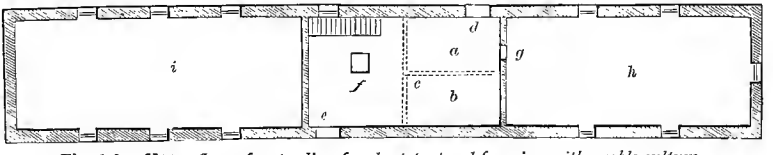


Fig. 678.—*Upper floor of a steading for sheep pastoral farming with arable culture.*

and then placed right under the door, and the sheaves forked from it into the barn; *e*, the window; *f*, a hatch in the floor, 3 feet by 3, communicating with the corn-barn below, for passing the roughs of grain to be re-threshed when no elevators are appended to the threshing-mill; *g*, a bole, 4 feet by 3½, communicating with the straw-barn, for the purpose of forking up any straw that may require to go again through the threshing-mill; *h* is the straw-barn, with boles in the wall; and *i* the granary, 18 feet by 48, extending over the killing-house, cart-shed, and implement-house, with three windows on each side, and entered directly from the corn-barn by a stair.

The extreme length of fig. 2, Plate II., over walls is 125 feet. The length of both wings is 113 feet. The width of the apartments within walls is 18 feet.

The scale of fig. 2, Plate II., is in the proportion of three-eighths and one-third of an inch to the foot. The scale of fig. 678 will be found in that of fig. 2, Plate II.

Steading for Arable Farming.

Such holdings as carse farms and any that are entirely under arable husbandry require steadings specially designed for that purpose. Accommodation has to be provided for the corn and straw, for the animals of labour, for fattening cattle, and a few cows to supply the farmer's family and the work-people with milk.

A plan of a steading suited to these requisites is given in Plate V. It will be found that this plan fully illustrates the principle of construction we have laid down, wherein the straw occupies the central position, and all the other apartments cluster around it as a centre.

The corn-barn *a* is 31 feet by 28, with a door to the stackyard and a window into a court, containing within it the space for the threshing-machine *b*, 18 feet by 8 feet 6 inches, and for the chaff-house *c*, 5 feet in width, with a door leading into the straw-barn *d*, 18 by 46 feet, with four doors, two leading into the cattle-courts,[1] and two into the open space conducting to the cart-horse stable and cow-byre. The boiling-house *e*, 18 by 24 feet, for the cooking of food for the horses, is a continuation of the straw-barn, and being in a two-storeyed range, is provided with a cock-loft or gangway to contain at hand the ingredients to be cooked, and with a door towards the stable and a window in the gable between the two boilers; *f* is the steam-engine room, 18 by 11 feet, with a door and window, as also a trap-door into the boiler-house *g*, 20 by 10 feet, with which is connected by a door the coal-store *h*, 20 feet by 5, having a window at the end. The chimney-stalk, 50 feet in height, is seen at the end of the boiler-house *g*; *i* is a shed for cattle, 18 feet by 30, and *k* a court, 30 feet by 30, connected with it; *l* is a shed for cattle, 18 by 38 feet, and *m* its court, 38 feet by

[1] In the plan (Plate V.) the cattle-courts are open, but the greater portion, if not the whole, should be covered in. The merits and demerits of covered and open courts have been fully discussed in Div. vol. i. p. 226.

30; *n* and o are the turnip-stores for the respective cattle-courts, *n* being 24 feet 9 inches by 7 feet, and *o*, 26 feet 9 inches by 7 feet. These apartments constitute the central portion of the steading.

In the right wing are these apartments: *p*, a loose-box, 18 feet by 18, with a door and window in front; *q*, the gig-house, 18 feet by 12, with a wide door in front; *r*, a hay-house, 18 by 20 feet, with a window and door in front, and an internal door into the cart-horse stable *s s*, 18 by 78 feet; *t* is a central door to bring the straw from the straw-barn into the stalls, and in front are a door and four windows; *u* is another hay-house, 18 by 14 feet, with a window in front and a door at the back; and *v* is the riding-horse stable, 18 feet by 18, with a door and window, and an internal door to the hay-house *u*.

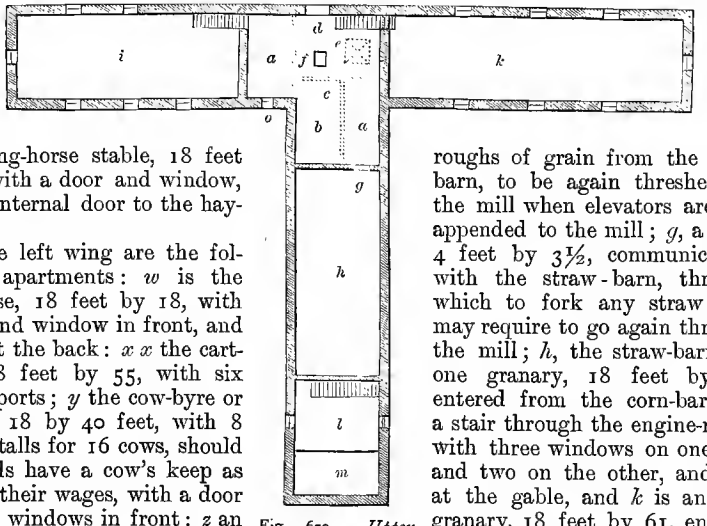


Fig. 679. — *Upper floor of a steading for carse farming.*

In the left wing are the following apartments: *w* is the hen-house, 18 feet by 18, with a door and window in front, and a bole at the back: *x x* the cart-shed, 18 feet by 55, with six arched ports; *y* the cow-byre or shippen, 18 by 40 feet, with 8 double-stalls for 16 cows, should the hinds have a cow's keep as part of their wages, with a door and two windows in front: *z* an implement-house, 18 feet by 18, with a door and window in front; *a'* an outhouse, 18 feet by 15, with a door and window in front; and *b'* another outhouse for any purpose, with a door and window in front.

The pigs may share the sheds and courts with the cattle, but a pig-sty for feeding them for domestic use may be erected as a lean-to against the gable of the boiling-house *e*.

The dotted lines show the construction of the building and the style of roofing, with the positions of the doors and windows and chimneys.

They also show the highest part of the building, which consists of two floors or storeys. The upper storey contains the apartments as shown in fig. 679, where *a a* is the upper barn immediately above the corn-barn and steam-engine room, with a bole for air o; *b*, the site of the threshing-machine with its gearing, drum, and shakers; *c*, the dotted lines, the beams of wood which support the threshing-machine; *d*, the door, 6 feet wide, leading to the stackyard, from which the sheaves are brought from the stack either on wheel-barrows or by carts loaded at the stack and placed right under this door, and the sheaves forked into the barn; *e*, the sky-light in the roof for giving light to the barn; *f*, a hatch in the floor, 3 feet by 3, for passing the roughs of grain from the corn-barn, to be again threshed by the mill when elevators are not appended to the mill; *g*, a bole, 4 feet by 3½, communicating with the straw-barn, through which to fork any straw that may require to go again through the mill; *h*, the straw-barn; *i*, one granary, 18 feet by 45, entered from the corn-barn by a stair through the engine-room, with three windows on one side and two on the other, and one at the gable, and *k* is another granary, 18 feet by 61, entered by a stair direct from the corn-barn, with three windows on each side and one at the gable; *l*, a cock-loft or gangway over the boiling-house, entered by a fixed trap-stair in that house; and *m* is a good place of warmth from the boiler for a pigeon-house, 18 feet by 6, up to the roof, and the pigeons to enter through the gable.

The scale of this plan is in the proportion of two-eighths and two-thirds of an inch very nearly to the foot. The scale of fig. 679 will be found in Plate V.

The extreme outside length of the principal east and west range of the build-

ing is 145 feet; the length of the middle range north and south is 83 feet; the length of the right wing is 169 feet, that of the left 170 feet. The width of all the apartments within walls is 18 feet.

On looking at the plan on Plate V., with the view of amendment, we think it would make a more compact arrangement to push the hay-houses and cart-horse stable up to the loose-box *p*, and place the gig-house *q* at the end of the building on this side of the riding-stable, with its wide door looking this way.

Steadings for Mixed Husbandry.

Mixed husbandry is the system of farming most largely pursued in the British Isles. Practised on every variety of soil between the two extremes of pastoral and carse farming, it is a combination in varying degrees of arable farming and the breeding, rearing, and fattening of live stock.

This mode of farming requires a large accommodation for arable purposes and for stock, and the arrangement of the apartments for these two purposes should be kept distinct, to avoid confusion in conducting the business of the steading. This system may be prosecuted either on a large or small scale, but the arrangement of the apartments are similar in both.

In fig. 1, Plate IV., we have given a plan of a steading for mixed farming on a large scale, in order to show the above requirements of the system in their fulness. In the centre of the principal range, as it should be, is the straw, to the right of which are the apartments for arable purposes, and to the left are those for live stock, and on either side of the straw-barn are the apartments for fattening the cattle in.

There are three accommodations for fattening cattle—namely, in hammels, in boxes, and in byres. All these three we have illustrated in the plan. Fig. 1 comprehends the feeding of cattle in hammels, which consist of small sheds with small open courts, in which cattle, few in number—two, three, or four together, according to their size and ages—are accommodated. The hammels are arranged in four divisions, two on one side of the straw-barn and two on the other. Supposing each hammel to contain two large oxen, 120 oxen could thus be fattened at the same time, and of course a proportionate larger number of smaller cattle. Fig. 2 represents the mode of feeding in boxes, which consist of pens large enough to hold one large ox or two small ones, all under a roof. The same number of cattle could be accommodated in a smaller space in boxes than in hammels. Sixty cattle can be contained in boxes in the space represented, as that number are in the two divisions of hammels on either side of the straw-barn. The third mode of feeding is in byres under a roof, as seen in fig. 3, in which the cattle are arranged in double stalls, and tied by the neck to a stake; and in the space represented, the same number, sixty, can be accommodated as in the boxes, fig. 2—so that byres take up the least room of the three modes of feeding.

Most farmers would now prefer covered courts to the hammels, chiefly on account of the saving in labour.

In fig. 1, Plate IV., *a* is the corn-barn, 18 feet by 27 at one part, and 18 feet by 20 at another part, with a door and window in front and one window at the back; *b* is the space occupied by the threshing-machine; and *c* that by the chaff-house, 9 feet by 5, with a window in front and an internal door leading into the straw-barn *d d*, 18 feet by 85, with two doors opposite at the threshing-machine, and two opposite at the other end; *f* is the steam-engine room, 18 feet by 12, with a window in front and a door at the back; *g* the boiler-house, 20 feet by 8, with a door in front and window at the end, and an internal door to the coal-store *h*, 20 feet by 5, with a window at the end. The chimney-stalk, 50 feet high, is seen rising from its basement.

In the right wing is *i*, a passage, 4 feet wide, leading into the stackyard; *k k* is a turnip-cutting-machine house, 18 feet by 50, with two doors and two windows in front, and a door at the back leading to the turnip-store *i' i'*, 58 feet by 4; *l* is a food-store, 18 feet by 24, with a door and window in front; *m m* is the work-horse stable, 18 feet by 72, having twelve stalls and a loose-box *n*, 18 feet by 8, with a door and two windows in front; o hay-house, 18 feet by 23, with a door and window in front, and an internal door to the work-horse stable and to the riding-

horse stable *p*, 18 feet by 18, with a door and window in front, and provided with three stalls; *q* is the gig-house, 18 feet by 12, with a wide door; *r* the horse boiler house, 18 feet by 18, with a door and window at the back towards the work-horse stable; *s* the implement-house, 18 feet by 12, with a door and window in front; and *t t* is the cart-shed, 18 feet by 57, with six port-holes in front.

In the left wing are these apartments: *u u* a second turnip-cutting-machine house, 18 feet by 50, with two doors and two windows in front, and a door at the back leading to the turnip-store *h' h'*, 50 feet by 4; *v* another food-store, 18 feet by 24, with a door and window in front; *w w* the cow-byre or shippen, 18 by 40 feet, for eight stalls, with a door and window in front; and *x* the calf-house, 18 feet by 28, with a door in front and two windows at the back. Where only as many cows are kept as serve the farmer's family with milk and butter, and where no calves are brought up, the byres may be of a size to suit the number of cows, and the calf-house dispensed with altogether, and used for some other purpose; *y* the servants' cow-byre, 18 feet by 35, with a door and two windows in front, and furnished with eight stalls. Where the farmer does not breed any cattle, the servants dispose of their calves to other purchasers; *z* the hen-house, 18 feet by 18, with a door and window in front, and a bole at the back; *a'* a hatching-house for poultry, 18 feet by 9; *b'* an outhouse, 18 feet by 18, with a door and window in front; *c' c'* pig-sties, six in number, the sties 8 feet by 4 each, and their courts 10 feet by 4 each. The pig-sties may be extended as desired, or their space occupied for some other purpose, and they erected by themselves elsewhere; *d'* the guano and bone-dust store, 18 feet by 20, with a door and window in front; and *e'* another boiling-house, 18 feet by 18, with a door and window in front.

The hammels for containing the fattening cattle are at *f' f', f' f'*, 12 feet by 10 in the sheds, and 14 feet by 10 in the courts *g' g', g' g'*. There are two rows of hammels in each division, on both sides of the straw-barn, each row containing fifteen hammels. We have placed the hammels in the plan in preference to boxes and byres, because we believe they are the best kind of accommodation for cattle to be fattened in the most healthy and sound condition, though the most expensive in construction.

A tramway, 3 feet wide, starts from opposite each of the doors *m' m'*, of the food-stores *v* and *l*, and runs parallel to them and the cutting-machine rooms *u u* and *k k*; then turns at right angles and runs parallel to the straw-barn *d d*; turns again at right angles, and runs parallel to the walls of the courts *g' g'*, of the hammels, in the lines *l' l'* and *k' k'*; then passes up the side of the hammels, and along their back, to the door *m'* of the food-stores. The small arrows indicate the routes of the tramways to and from the food-stores. The food prepared in the cutting-rooms *u u* and *k k* is placed in trucks upon the tramway, and delivered to each hammel over the front walls *g' g'* of the courts, into the feeding-troughs inside.

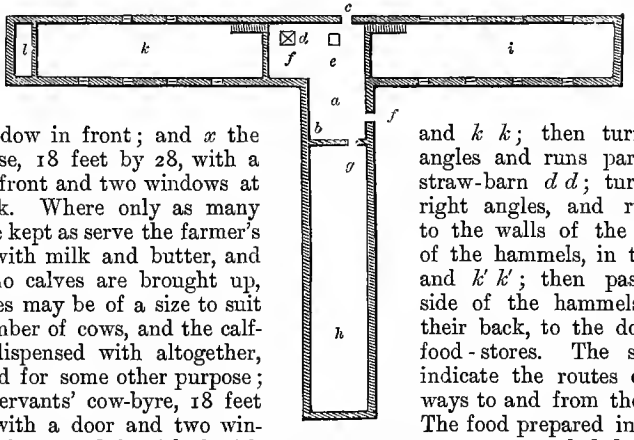


Fig. 680.—*Upper storey of a steading for common farming.*

Fig. 2, Plate IV., is an illustrative plan of cattle-boxes, which may be adopted where this method of feeding is preferred to hammels: *a a* is the central passage, 10 feet wide, for receiving the cattle and removing the dung from the central boxes; *b b, b b* passages, 5 feet wide, along which the food is delivered to each box on each side; *c c* are the boxes, 8 feet square, to hold one ox; *d* are the doors by which the dung is removed when desired. These boxes contain sixty cattle, the same as in a double

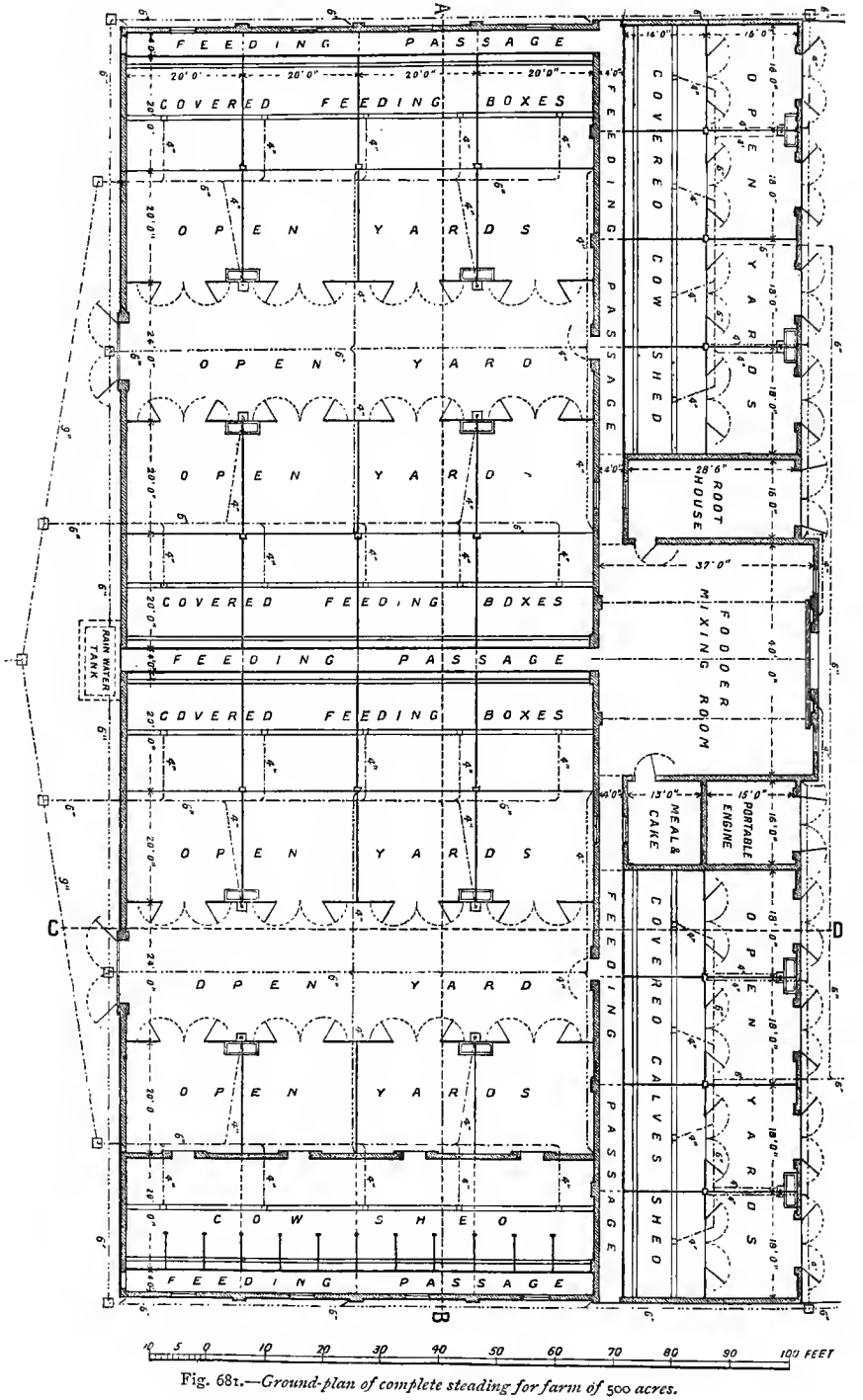


Fig. 681.—*Ground-plan of complete steading for farm of* 500 *acres.*

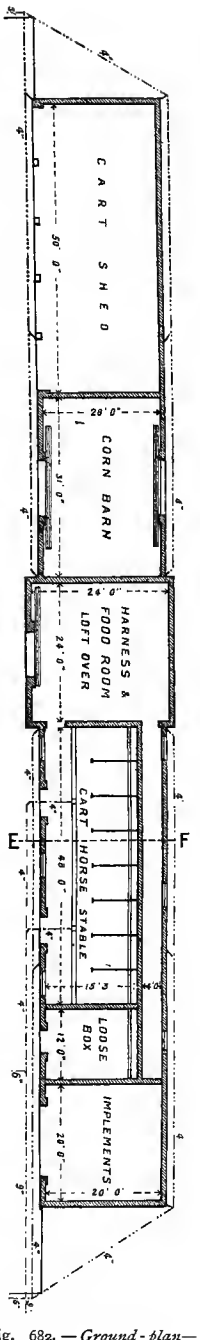


Fig. 682. — *Ground-plan*— continued.

row of hammels. The bottoms of the boxes are usually dug 18 inches or 2 feet below the surface of the ground. Cattle-boxes are best lighted from the roof.

In fig. 3, Plate IV., is an illustrative plan of cattle-byres, when they are preferred for fattening cattle either to boxes or hammels: *a a* is the middle passage, 5 feet wide, with a dung-grupe on each side; *b b* and *c c* the feeding passages, 5 feet wide, and *d d*, *d d* the stalls affording accommodation to sixty cattle. These byres may be lighted either by windows in the outside walls, or by sky-lights in the roof.

Where the arrangement of byre-feeding is adopted, a place for the dung will be required, and this is provided for in the covered dung-stance *e e*, fig. 4, Plate IV., the dimensions of which are 18 feet by 50, and a door, 9 feet wide, at each end, for a cart to be backed through to remove the dung.

It may be both curious and interesting to state the space occupied by each ox respectively in hammels, boxes, and byres. The hammels give 191½ square feet to each ox, the boxes 115¾ square feet, and the byres 106½ square feet—so that hammels occupy 1¾ and boxes 10 per cent more of space than byres.

Power can be derived from the engine to drive turnip-cutters in the cutting-machine rooms *u* and *k*, and corn and oilcake bruisers in the food-stores *v* and *l*, as also a straw-cutter in the straw-barn *d*.

The dotted lines show the structure of the buildings and their roofs, and the positions of the doors and windows, and of the chimney-stalks, and specially of the engine-stalk rising 50 feet from its basement.

The highest part of this steading is a part of the principal range on each side of the threshing-machine and the centre range, the principal range being divided into upper and lower storeys. In fig. 680 is the plan of the upper storey in both ranges, in which *a* is the upper barn, 18 feet by 30 in the widest part, and 18 feet by 20 in the narrowest, directly over the corn-barn and the engine-room; *b* the site of the threshing-machine, with its drum and shakers and gearing; *c* the door, 6 feet wide, by which the sheaves of corn are brought from the stackyard; *d* a sky-light in the roof for light to the barn; *e* a hatch in the floor, 3 feet by 3, through which the roughs may be handed up from the corn-barn below to be again passed through the mill when there are no elevators; *f*, bole to admit air to the sheaves when stowed in the barn; *g* an opening, 4 feet wide by 3½ feet high, for permitting straw to be forked up from the straw-barn, when it is desired to be again passed through the mill; *h* the straw-barn; *i* a granary, 18 feet by 76, with four windows on each side, and entered by a stair from the corn-barn; *k* a granary, 18 feet by 72, with three windows to the north and four to the south, and entered by a stair from the corn-barn across the engine-room; and *l* the pigeon-house, partitioned from the granary *k*, 18 feet by 6, with a trap-stair from the food-store *v* below, and entered by the pigeons through the gable.

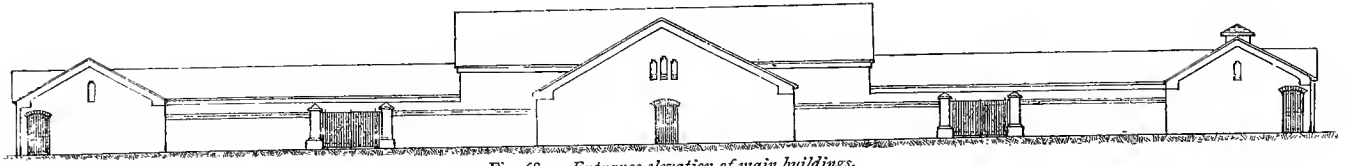


Fig. 683.—*Entrance elevation of main buildings.*

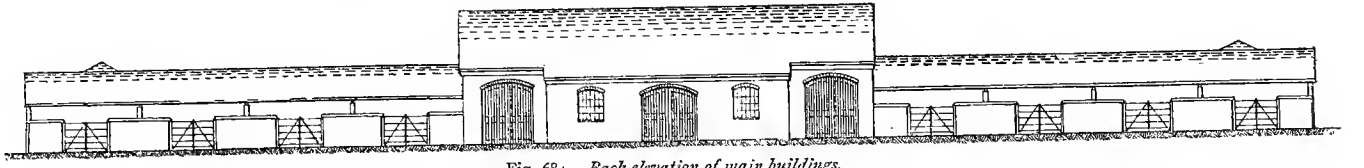


Fig. 684.—*Back elevation of main buildings.*

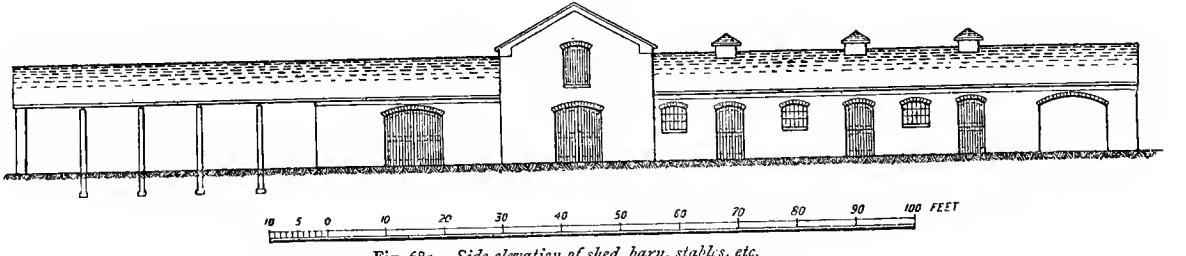


Fig. 685.—*Side elevation of shed, barn, stables, etc.*

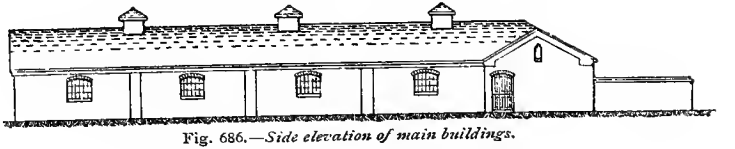


Fig. 686.—*Side elevation of main buildings.*

The scale of this plan is in the proportion of rather more than 1½ eighth of an inch to the foot. The scale of fig. 680 will be found in Plate IV.

The extreme length of this plan of steading over walls of the principal range is 463 feet, that of the right wing 128 feet, that of the centre range 106 feet, and that of left wing 129 feet. The width of all these ranges is 18 feet within walls. The length of each row of hammels over walls is 174 feet, and width 33 feet. The length of the cattle-boxes, fig. 2, over walls, is 125 feet, and width 57 feet. The length of the cattle-byre, fig. 3, over walls is 153 feet, and width 42 feet. The length of the dung-house, fig. 4, is 55 feet, and width 29 feet.

Modern English Steading. — In figs. 681 to 689 are given the illustrations of a modern English steading or homestead, suited for a farm of about 500 acres. In figs. 681 and 682 are given the ground-plan of complete steading; in fig. 683, the entrance elevation of main buildings; in fig. 684, the back elevation of main buildings; in fig. 685, the side elevation of shed, barn, stables, &c.; in fig. 686, the side elevation of main buildings; in fig. 687, section and elevation of main buildings at A B; in fig. 688, section of main buildings at C D; in fig. 689, section of stables at E F. The plans of this steading were prepared specially for this edition of the *Book of the Farm* by Mr Gilbert Murray, agent to the Earl of Harrington, Elvaston Castle, Derby. It will be seen that the buildings are commodious, substantial, and convenient.

The complete specifications for the erection of this steading are given at page 378 of this volume.

Modern Scotch Steading.—In fig. 690 is given the ground-plan of a commodious, handsome, and very complete steading erected on a farm in Inverness-shire.

This steading is adapted for a farm of about 250 to 280 acres, worked on the five-course rotation, where cattle are reared and fed. The central part of the steading consists of the straw-barn, turnip-house, and oilcake-store. In these the feeding materials are

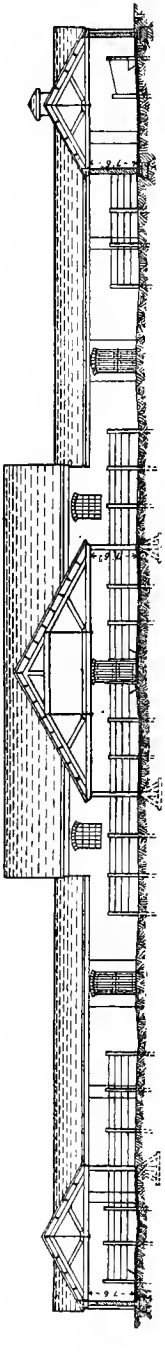


Fig. 687.—*Section and elevation of main buildings at* A B.

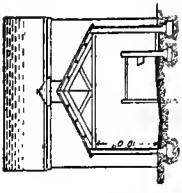


Fig. 689.—*Section of stables at* E F.

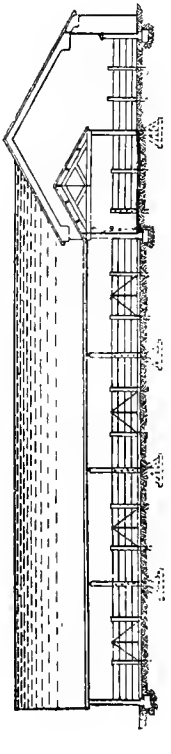


Fig. 688.—*Section of main buildings at* C D.

stored, and the byres, cattle-courts, and stables are grouped around them, so that the labour of conveying the food to the animals may be lessened as far as possible.

The stables, byres, and cattle-courts all communicate with the straw-barn by covered passages, which prevents straw from being strewn about the steading. The granaries are over the cart-shed, gig-house, turnip-shed, and oilcake-store. The grain is thus stored above compartments in which no animals are kept, so that it cannot be injured by animal exhalations.

The byres and stables surround the cattle-courts, into which the dung can be

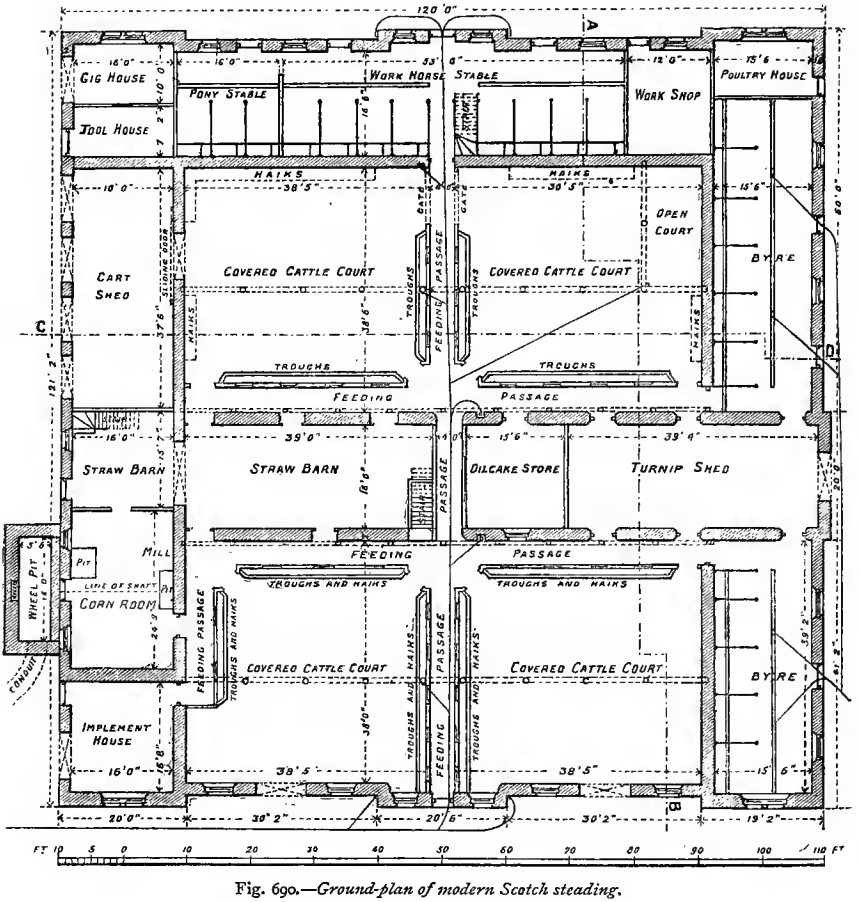


Fig. 690.—*Ground-plan of modern Scotch steading.*

easily conveyed, and in which it is protected from deterioration by exposure to rain.

It will be observed that the cattle-court adjoining the stables and cart-sheds is entirely covered in. It would perhaps have been the better of a small opening, but it was felt that if this had been formed here it would have caused a draught between the two courts, and destroyed the comfort of the cattle. In all the other courts there is a small portion uncovered. The factor on the estate thinks it desirable to have a small uncovered space in all courts in which are wintered young cattle to be turned out to grass in the following spring. Even for fattening cattle he would have an open space, when it can be provided without causing draughts.

The cow-byre, poultry-house, stable, gig-house, and workshop are placed near the dwelling-house. Obviously this is a convenient and desirable arrangement.

Fig. 691 gives a section of the cow-byre.

If it were desired to have a few pigs in the courts, a small retreat for them could easily be formed in a corner.

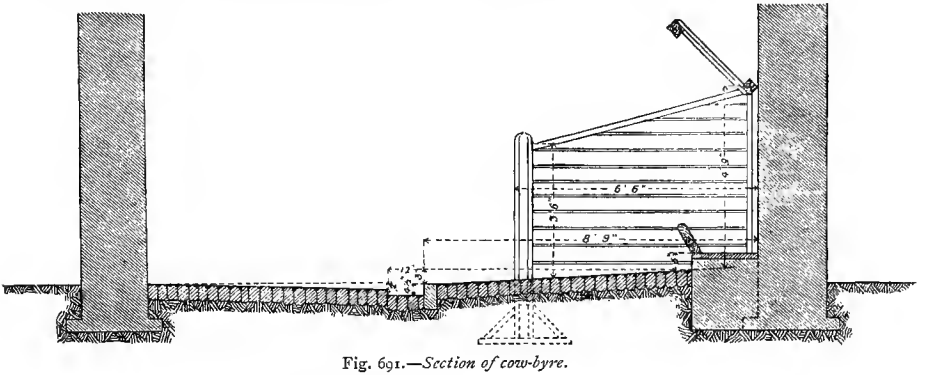


Fig. 691.—*Section of cow-byre.*

The steading is constructed in a substantial form, and finished with excellent taste. From the elevations given it will be seen that the outward features are attractive and symmetrical.

In fig. 692 is given the front elevation of this steading; in fig. 693 the south elevation; in fig. 694 the north elevation; in fig. 695, section at A B; in fig. 696, section at C D; and in fig. 697,

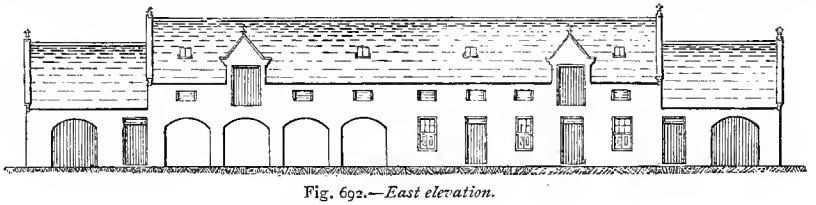


Fig. 692.—*East elevation.*

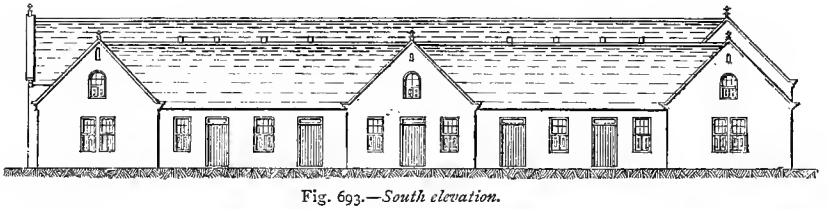


Fig. 693.—*South elevation.*

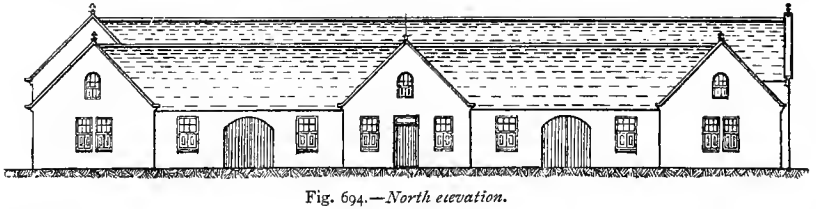


Fig. 694.—*North elevation.*

plan of the roofs, lofts, and men's sleeping-place.

The specifications for the erection of this steading are given in this vol., p. 385.

Forfarshire Steading.—It may be ad-

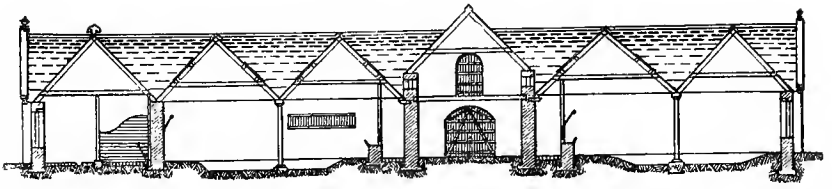


Fig. 695.—*Section at* A B.

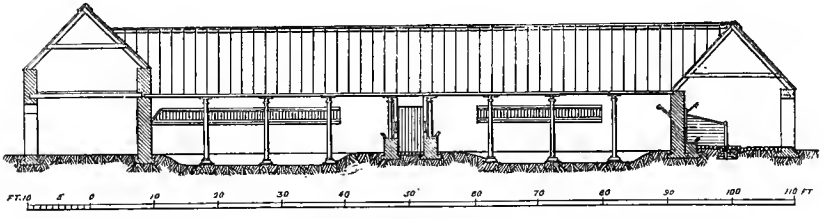


Fig. 696.—*Section at* C D.

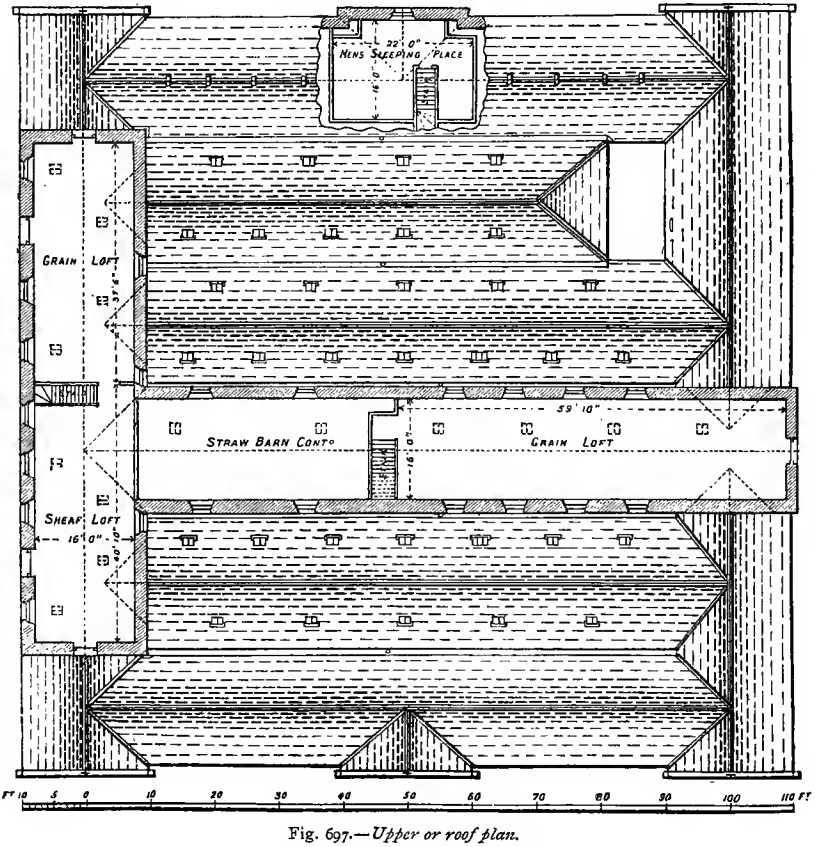


Fig. 697.—*Upper or roof plan.*

visable before concluding this part of our work, to give an illustration of how an old and inconvenient steading may be altered into a new and convenient one.

Plate VII. contains all the particulars connected with the alterations and additions effected on the steading at Inverquharity, in Forfarshire. Fig. 1 contains the ground-plan of the new and old parts of the steading, the open outlines showing the old, and the shaded lines the new parts of the steading. Fig. 2 is a roof-plan of the entire steading as amended. Fig. 3 is a south elevation of the steading as amended, the plain part showing the old, and the stippled part the new portion of the steading. Fig. 4 is a vertical section of the finished buildings, indicated by the horizontal line A B in fig. 1. Fig. 5 is a vertical section at the vertical line C D in fig. 1. And fig. 6 is a vertical section at the vertical line E F in fig. 1.

In fig. 1, Plate VII., in the central range are: *a* the corn-barn, 15 feet by 33, with a door and window in front; *b* chaff-house, 7 feet by 28, with a door into the straw-barn; *c* straw-barn, 22 feet by 51, with two doors opposite near the mill; *d* implement-house and guano-store, 12 feet by 22, with a large gate to the front.

In the right wing are these apartments: *e* cart-shed, 19 feet oy 58, with five port-holes: *f* hay-house, 18 feet by 19, with a door in front, and an internal one to the cart-horse stable; *g* cart-horse stable, 18 feet by 65, of eleven stalls, with a door and window at the back, a window into the cattle-court *k*, and two sky-lights in the roof; *h* loose-box, 18 feet by 10, with a door in front; *i* cattle-shed, 18 feet by 23, furnished with a feeding-trough and a turnip-shed; *k* cattle-court, 22 feet by 23, with a gate in front; *l* riding-horse stable, 12 feet by 16, with a door; *m* boiling-house, 12 feet by 11, with a boiler and furnace, and a door in front; and *a'* outhouse, 17 feet by 6, with a door.

In the left wing are these apartments: *n* water-wheel ark or steam-engine room, 17 feet by 6, with a window in front, and door into the open passage *v*; *o* cow-byre, 17 feet by 11, with a window in front and door to the passage *v*; *p* cattle-byres, 17 feet by 93, of four compartments, each with a door into the open passage *v* and turnip-shed *q*; *q* turnip-shed, 14 feet by 93, with four doors in front; *r* hen-house, 14 feet by 14, with a door in front; *s s* cow-byre, 16 feet by 60, of nine stalls, with doors into the adjoining cattle-byre *p*, open passage *v*, and cattle-court *w*; *t* loose-box, 16 feet by 11, with a door in front.

The open space between the left wing and central range is occupied by four covered cattle-courts *w*, one being 31 feet by 41, another 31 feet by 45, a third 31 feet by 45 at the widest part and 30 feet at the narrowest, and the fourth 31 feet by 41 at the broadest part, and 14 feet at the narrowest, with doors into the passages and gates in front; *z* the urine-tank, 15 feet by 5; and *y* turnip-store, 15 feet by 31, with a gate in front. This store supplies turnips from its centre to a double row of feeding-troughs along a 3-feet passage *x*, through the centre of the cattle-courts *w*, as also through three boles in each of its side walls into feeding-troughs in two of the courts at *b' b'*. These covered courts are lighted by eight sky-lights in the roof, as seen in fig. 2. They are separated from the central range by a covered passage *u*, 5 feet by 72, and from the principal range by an open passage *v*, 6 feet by 97.

The two-storeyed portions of this amended steading are the principal range to the right and the central range. The upper storey of the principal range comprehends the upper barn, 33 feet by 22, over the corn-barn and chaff-house, and the granary, 19 feet by 77, over the cart-shed and hay-house, having a stair from the corn-barn, with windows on both sides. The upper storey of the central range consists only of one apartment over the implement-house *d*.

The double dotted lines show the urine drainage from the byres and covered courts to the urine-tank *z*.

It will be seen by the plan roof, fig. 2, Plate VII., that only two stretches terminate in gables, at the loose-boxes *h* and *t*, the most in pavilions, while the outhouse *a'* has a lean-to roof.

The extreme length of this steading over walls is 226 feet, and its extreme breadth in the right wing is 98 feet, and that of the left wing 108 feet. The width of the apartments varies from 16, 17, 18, 19, to 21 feet.

What the original form of this steading was, we do not know, but in the amended form, as represented in Plate VII., it is arranged very much on the principles we have been advocating, having a principal range, a central one, and right and left wings. The straw is conveniently placed in the central range for the stables on the right, and the covered cattle-courts on the left, and not far from the cow-byre *s*. Instead of having the wings extended to afford accommodation to feeding cattle, the space between the central range and left wing is occupied by covered sheds and courts, with access to them by means of passages. This arrangement admits of putting these apartments under one roof. Upon the whole, this is a compact, convenient steading, and is a good illustration of how an old faulty steading may be converted into a good new one. There should be a window in the hay-house to afford light to the men when taking the hay for the horses. The cattle-shed marked *p* should be fitted up as a byre for feeding cattle, in order to allow the turnips to be wheeled into the cow-byre *s* from the store at *q*.

Steadings for Dairy Farming.

Dairy farming may be conducted entirely by itself or in conjunction with other systems of farming. In many cases the breeding and rearing of cattle are pursued along with dairying. In others the only live stock kept are cows (the stock of these being maintained by purchases), pigs, poultry, and horses to work the arable land. Steadings for dairy farms must therefore vary considerably in design.

Large Dairy Farm.

In Plate VI. is given the ground-plan of a modern steading for a large dairy and cattle-breeding farm. This plan was designed by Mr Gilbert Murray, and specially prepared for this edition. The houses are adapted for the accommodation of eighty cows and forty young cattle. The plan shows clearly the arrangement of the buildings.

Small Dairy Farm.—The plan of a farm steading for a small dairy farm is given at fig. 1, in Plate III.

Here the centre is devoted to the purposes of the straw, where *a* is the corn-barn, 18 feet by 24, with a door and window at the back in the stackyard, including the space appropriated to the threshing-machine at *b*, and the chaff-house at *c*, 5 feet wide, with a window in front, and an internal door leading into the straw-barn *d*, 18 feet by 24, with a door in front and one at the back into the stackyard; *e* is the horse-course, 27 feet diameter, in which a two-horse power driving-gear is fixed.

In the right wing is *f*, the cart-horse

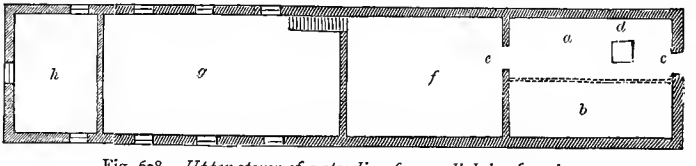


Fig. 698.—*Upper storey of a steading for small dairy farming.*

stable, 18 feet by 18, for three stalls, and with a door and window in front; *g* cart-shed, 18 feet by 18, with two port-holes; *h* the riding-horse stable, 18 feet by 12, with a door and window in front, and furnished with two stalls; *i* is the gig-house, 18 feet by 9, with a wide door; *k* the implement-house, 18 feet by 10 feet 6 inches, with a door and window in front; *l*, an outhouse, 18 feet by 12, with a door and window in front; and *m*, a bull's hammel, 18 feet by 11, with a door and window in front.

In the centre and left wing, connected with the dairy, are the following apartments: *o* is the churning-room, 18 feet by 18, with a door and window in front; *q* is the food-store and cheese-press room, 18 feet by 12, with a window and door in front; *r* the milk-house, 18 feet by 25, with a door in front and two windows at the back, and furnished with stone shelving all round;[1] *s* the byre for

[1] An improvement on this plan would be the removal of the churning-room, cheese-press room, and milk-house to a separate building

heifers, 18 feet by 24, with a door and window in front; *t t* the cow-byre or shippen, 18 feet by 56, having seven double-stalls, each 8 feet wide; and *u* is the hen-house, 18 feet by 8, with a door at the back, a window in the gable, and a bole in front.

In the space between the wings are these apartments: *v* the hay-house for supplying hay to the stables and byres, 18 feet by 24, with a window, and with a door on each side; *w* the wash-house, 18 feet by 12, with a window and door, and boiler for cleansing the dairy utensils; *x* the boiling-house, 18 feet by 18, with a door on one side and a window on the other, and two boilers for preparing food for the cows, horses, and pigs; and *y y y* are pig-sties, 5 feet 6 inches by 5 feet each, with courts *z z z*, the central one being 5 feet 6 inches by 5 feet, and the two extreme ones each 6 feet by 5. These sties are covered with a lean-to roof against the gable of the adjoining boiling-house.

Gearing may be erected for driving a straw-cutter in the straw-barn *d*, and the churn in the churning-room *o*; and the gearing might be extended in front, under-ground, into the hay-house *v*, for driving a hay-cutter there.

The dotted lines show the structure of the building, and the position of the windows, doors, and chimneys.

The highest part of this steading is confined to the principal range, which is divided into an upper and lower floor. The upper one contains the apartments shown in fig. 698, where *a* is the upper barn immediately above the corn-barn; *b* the site of the threshing-machine, with its gearing, drum, and shakers. It would be better to have the mill near the power, in which case the positions of the corn-barn *a*, in Plate III., fig. 1, and the mill *b* and chaff-house *c* should be reversed. *c* the door, 6 feet wide, for receiving the sheaves; *d* a hatch in the floor, 3 feet by 3, to pass the roughs of grain from the corn-barn below to be re-threshed by the mill; *e* a bole, 4 feet by 3½, communicating with the straw-barn to allow any of the straw to be forked up to be again passed through the mill if necessary; *f* the straw-barn; *g* the granary, 18 feet by 35, entered by a stair from the straw-barn, to which direct access is given by the back-door of the

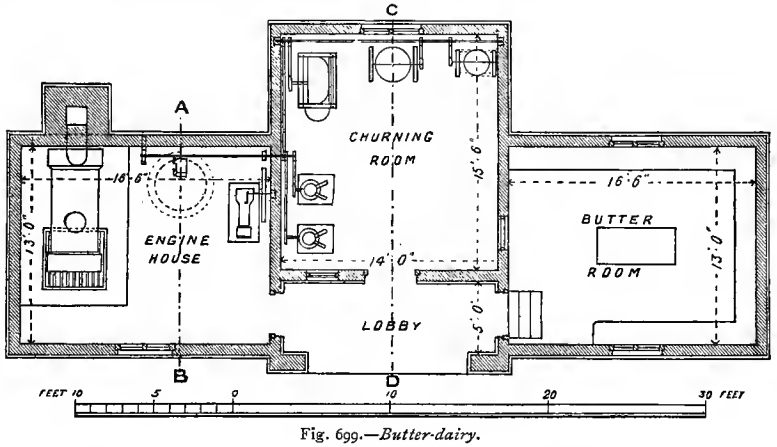


Fig. 699.—*Butter-dairy.*

straw-barn from the corn-barn; and *h* is the cheese-room, 18 feet by 15, with a window on each side, and one in the gable, and entered by a stair from the cheese-press room below.

The scale of this plan is in the proportion of one-third and three-eighths of an inch to the foot. The scale of fig. 698 will be found at fig. 1, Plate III.

The extreme length of the central range over walls is 103 feet, that of the right and left wings 119 feet, and that of the intermediate range 71 feet. The width

near, but still detached from the steading. These now usually adjoin the rear of the farm dwelling-house.

within walls of all the apartments is 18 feet.

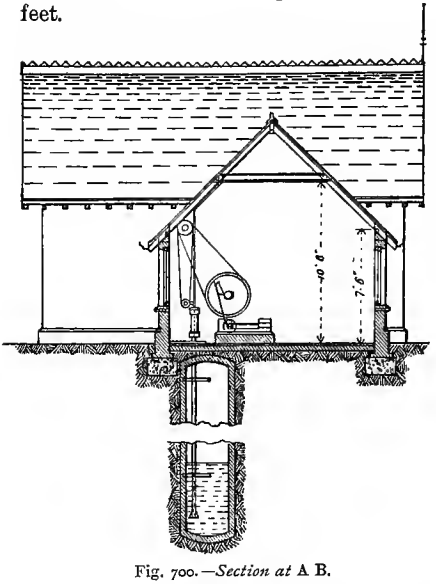


Fig. 700.—*Section at* A B.

Fig. 699 shows the ground-plan of a modern English butter-dairy, designed by Mr Gilbert Murray. Fig. 700 gives a section at A B, showing the position of the engine; fig. 701 a section at C D, showing the positions of the separators and refrigerator; and fig. 702 the front elevation.

Steadings for Suburban Farming.

The land in the immediate vicinity of towns is usually devoted to the cultivation of vegetables for the domestic use of the inhabitants. Around large towns this garden culture may extend for a mile or so, and beyond that distance commences what we have denominated suburban farming, the object of which is to supply those products to the inhabitants which are not afforded by the garden, such as straw, hay, turnips, forage, potatoes, milk, &c. Suburban farming is therefore either entirely arable or entirely dairy, each of which requires a different arrangement.

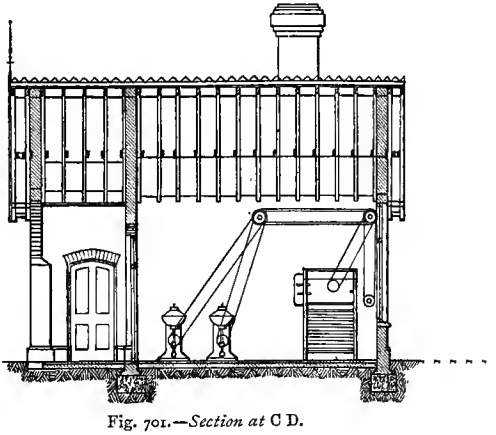


Fig. 701.—*Section at* C D.

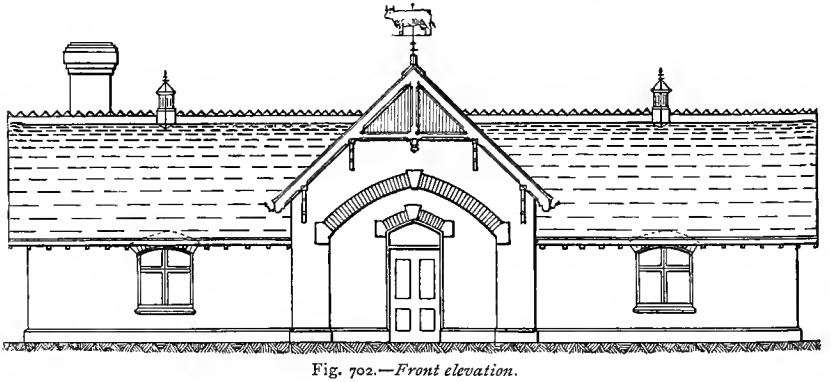


Fig. 702.—*Front elevation.*

Suburban Farming with Arable Culture.—The plan of a steading applicable to a farm of this description is given at fig. 2, Plate III. It has its central portion occupied by the straw, and the right wing is devoted to arable culture, while the left is appropriated to domestic purposes. In the central range is the corn-barn *a*, 18 feet by 30, with a window in front, and a door and window

at the back, in the stackyard. The barn includes the space for the threshing-machine *b*, and the chaff-house *c*, 5 feet by 9, with a window in front, and an internal door leading into the straw-barn *d*, 18 feet by 40, with one door in the front, another on the opposite side leading into the cattle-court *u*, and a third into the space in front of the cow-byre *z*; *f* is the boiling-house, 18 feet by 20, with a door and window in front; *g* is the steam-engine room, 18 feet by 12, with a door and window in front, and a trap-door at the back entering at level of the top of the boiler, and leading by steps to the floor of the engine-room; *h* is the boiler-house, 20 feet by 7, with a door in front and a window at the end, and an internal door into the coal-store *i*, 20 feet by 4, having a window at the end. The chimney-stalk is seen rising 50 feet in height from the basement.

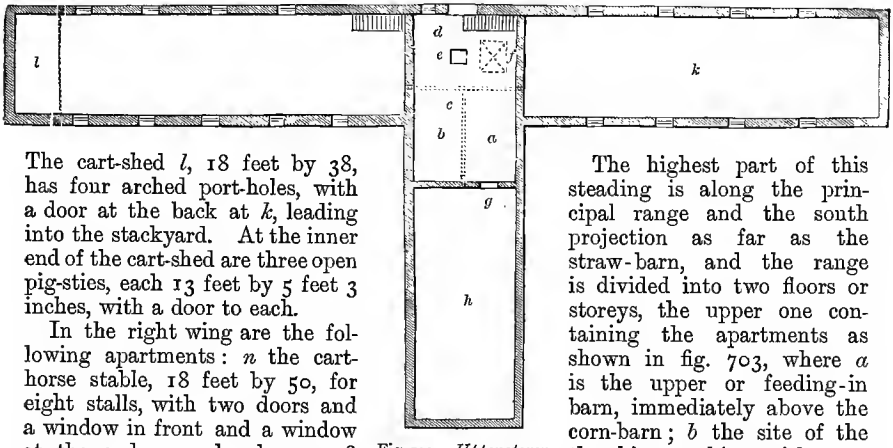


Fig. 703.—*Upper storey of a steading for suburban farming with arable culture.*

The cart-shed *l*, 18 feet by 38, has four arched port-holes, with a door at the back at *k*, leading into the stackyard. At the inner end of the cart-shed are three open pig-sties, each 13 feet by 5 feet 3 inches, with a door to each.

In the right wing are the following apartments: *n* the cart-horse stable, 18 feet by 50, for eight stalls, with two doors and a window in front and a window at the end; *q* a hay-house, 18 feet by 9, with a door in front, and two internal doors, one leading to the cart-horse, the other to the riding-horse stable; *r* the riding-horse stable, 18 feet by 18, having three stalls and a door and window in front, and an internal door to the hay-house; and *s* the gig-house, 18 feet by 12, with a wide door in front.

In the centre and left wing are these apartments: *t* a shed for cattle under the principal range, 18 feet by 32, with an arched port 9 feet wide, and outside a courtyard *u*, 45 feet 9 inches by 26 feet, having a gate to the space outside, and a door to the straw-barn; *v* the hen-house, 18 feet by 13, with a door and window in front; *w* outhouse, 18 feet by 10, with a door and window in front; *x* implement-house, 18 feet by 17, with a door and window in front; *y* turnip-store, 18 feet by 18, with a door and window at the back; and *z* cow-byre, 18 feet by 31, with a door and window at the back.

It would be an improvement to transpose those three compartments, the hen-house *v*, the outhouse *w*, and the implement-house *x*, and the turnip-store *y*, and the cow-byre *z*. The turnip-store would then be in the corner, and within easy access of the cattle-shed *t*, cattle-court *u*, and cow-byre *z*. A cart-door should open to the outside of the turnip-store. A roof should be thrown over the cattle-court *u*.

The dotted lines show the structure of the buildings, the position of the doors and windows, and of the chimney-stalks.

The highest part of this steading is along the principal range and the south projection as far as the straw-barn, and the range is divided into two floors or storeys, the upper one containing the apartments as shown in fig. 703, where *a* is the upper or feeding-in barn, immediately above the corn-barn; *b* the site of the threshing-machine, with gearing, drum, and shakers; *c* the beams of wood which support the threshing-machine; *d* the door, 6 feet wide, leading to the stackyard, from which the sheaves are brought from the stack to the barn, either on wheel-barrows or on carts loaded at the stack, and then placed under this door to be forked into the barn; *f* skylight in the roof over the head of the man that feeds the sheaves into the mill; *g* a bole, 4 feet high by 3½ feet wide, communicating with the straw-barn, for allowing any straw to be forked that requires to be again passed through the

mill; *h* is the straw-barn; *k* one granary, 18 feet by 64, with four windows on each side, and entered by a stair direct from the corn-barn; *i* another granary, 18 feet by 62, with five windows on one side and four on the other, and entered from the corn-barn by a stair through the engine-room; and *l* the pigeon-house, 18 feet by 6, entered by a trap-stair from the hen-house below.

The scale of this plan is in the proportion of nearly three-eighths of an inch to the foot. The scale of fig. 703 will be found at fig. 2, Plate III.

The extreme length of the principal range over walls is 158 feet, that of the right and left wings 95 feet, that of the middle range 64 feet, and all apartments 18 feet in width within walls.

Suburban Dairy Farming.—In suburban dairy farming the chief object is the production of new milk for immediate consumption in towns. For this purpose a large accommodation should be provided for cows, and for the preparation of their food. At the same time, there should be facilities for converting some of the milk into butter, and even into cheese. There must always be arable culture in connection with dairy husbandry, and in case the entire arable products should not be consumed on the farm, the surplus is sent to market. It will thus be easily understood that suburban dairy farming should be conducted on a somewhat large scale, and that the size of the steading should bear an adequate proportion to the extent of the farming. The cows in a suburban dairy being purchased, either calved or about to calve, in the weekly markets, no accommodation is required for the rearing of young stock; nor are hammels for bulls needed in such farming, as the cows are allowed to yield milk as long as they can, and are then disposed of to the butcher in fair condition.

FARMHOUSES.

The principles which should regulate the choice of the relative positions of the farmhouse and steading are deserving of careful consideration.

Position of Farmhouse and Steading.—In regard to the relative positions which the farmhouse and steading should occupy, it has been remarked that "it is generally advised that the farmhouse should be placed directly in front; to which, however, it may be objected that it casts a shade over the southern entrance of the yard, if very near; and if too far off, its distance will be found to be inconvenient. Perhaps the best situation is on one side of the farmyard, with the common parlour and kitchen opening nearly into it: farmers may talk as they like about unhealthy odours arising from the stables and yards, but there never was any one injured by them, and they cannot keep too close an eye upon their servants and stock."[1]

If farmers "cannot keep too close an eye upon their servants and stock," and if the position of their houses will enable them to do so, they should do something more than place them "on one side of the farmyard"; they must remain constantly in them, and cause "their servants and stock" to be continually in sight in the farmyard, otherwise their watching will be of no avail; for when the servants come to know that the house has been placed there merely to watch their proceedings, they, at least, if not the stock, can and will easily avoid the particular place constantly overlooked by the house. The truth is, and every farmer knows it, that it is not the spot occupied by his house, whether here or there, that maintains his authority over his servants. He knows that he himself must be "up and doing" in the fields, in the farmyard—everywhere—ere he can ascertain whether his servants are doing their work well and his stock thriving apace.

Inconvenience to himself in going a great distance betwixt his house and the steading will induce the farmer to place his house *near* rather than at a distance from the steading. He wishes to be within call,—to be able to be on the spot in a few seconds, when his presence is required in the farmyard, the stable, the byre, or the barn; but more than this he does not want, and need not care for. Place the house, therefore, if the choice is given, on some pleasant spot, neither "direct in front" nor much in the rear of the steading. If there be no such

[1] *British Husbandry*, i. 86.

spot at hand, make one for the house, place it there, and dwell in it with the comfortable assurance that servants will not regard their master the less, or the stock thrive the worse, because he happens to live beyond the influence of the "unhealthy odours arising from stables and yards,"—odours, by the way, of the unpleasantness of which we never heard a farmer complain. No one of that class but a sloven would place his house beside a dunghill.

Site of Farmhouse.—With reference to *site*, Mr Allen, in his American work entitled *Rural Architecture*, has some remarks worth quotation: "A fitness to the purpose for which the dwelling is constructed should unquestionably be the governing point in determining its position. The site should be dry and slightly declining, if possible, on every side; but if the surface be level, or where water occasionally flows from contiguous grounds, or on a soil naturally damp, it should be thoroughly drained of all superfluous moisture. That is indispensable to the preservation of the house itself and the health of its inmates. The house should so stand as to present an agreeable aspect from the main points at which it is seen, or the thoroughfares by which it is approached. It should be so arranged as to afford protection from wind and storm to that part most usually occupied, as well as be easy of access to the out-buildings appended to it. It should have an unmistakable front, sides, and rear; and the uses to which its various parts are applied should distinctly appear in its outward character. It should combine all the advantages of soil-cultivation, water, shade, and shelter, which the most liberal gratification, consistent with the circumstances of the owner, may demand. If a site on the estate command a prospect of singular beauty, other things equal, the dwelling should embrace it; if the luxury of a stream or a sheet of water in repose present itself, it should, if possible, be enjoyed; if the shade and protection of a grove be near, its benefits should be included—in fine, every object in itself desirable, and not embarrassing to the main purposes of the dwelling and its appendages, should be turned to the best account, and appropriated in such a manner as to combine all that is desirable both in beauty and effect, as well as in utility, to make up a perfect whole in the family residence.

"Attached to the building site should be considered the quality of the soil as affecting cultivation and growth to shrubbery and trees—at once the ornament most effective to all domestic buildings, grateful to the eye always as objects of admiration and beauty—delightful in the repose they offer in hours of lassitude or weariness; and to these, that indispensable feature in a perfect arrangement, the garden, both fruit and vegetable, should be added."

Trees and Shrubs.—On the subject of trees and shrubs—a due appropriation of which "to an agreeable residence is equal in importance to the style and arrangement of the house itself"—the same author has some remarks worthy of notice. "The proper disposition of trees and shrubbery around, or in the vicinity of buildings, is far too little understood, although tree-planting about our dwellings is a practice pretty general throughout our country. Nothing is more common than to see a man build a house, perhaps in the most elaborate and expensive style, and then plant a row of trees close upon the front, which, when grown, will shut it almost entirely out of view, while he leaves the rear as bald and unprotected as if it were a barn or a horse-shed—as if in utter ignorance, as he probably is, that his house is more effectively set off by a flanking and background of tree and shrubbery, than in front—and this is called good taste. Let us examine it. Trees near a dwelling are desirable for shade; shelter they do not afford, except in masses, which last is always better given to the house itself by a verandah. Immediately adjoining, or within touching distance of a house, trees create dampness, more or less litter, and frequently vermin. They injure the walls and roof by their continual shade and dampness. They exclude the rays of the sun, and prevent a circulation of air. Therefore, close to the house, trees are absolutely pernicious, to say nothing of excluding all the architectural effect from observation, when, if planted at proper distances, they compose its finest ornaments."

Working Part of the House.—The principles which should regulate the arrangement of that part of the farmhouse which is exclusively devoted to labour have an intimate connection with the management of the farm. The part we allude to includes the kitchen and dairy, and their accompanying apartments. Now it may frequently be seen in the plans furnished by architects, that to give the farmhouse a fashionable and airy appearance, the working portion of it is contracted and inconveniently arranged. The principle of its construction should be, to make this part of the house thoroughly commodious in itself, and at the same time prevent its giving the least annoyance to the rest from noise or disagreeable effluvia, which cannot at all times be avoided in the labours of the kitchen. Both objects would be accomplished by placing it independent of the main body of the house, and this is best effected by a jamb. Whatever may be the external form given to the house, the relative positions of its two parts may easily be preserved, whether in the old-fashioned form of a front tenement and back jamb, or the more modern and beauteous form of the Elizabethan style.

Plan of Kitchen, &c. — The ground-plan which we recommend of the kitchen and useful parts of the farmhouse in which work is performed, may be seen in fig. 704, where *a* is the kitchen, 18 feet by 16, and 10 in height, provided with two windows; a door into the interior of the house, another to the kitchen-pantry *k* and dairy *m*, and a third to the scullery *d* and porch *p*. A large kitchen-range, oven, and furnace-pot are at *b*, a commodious lock-up closet *c*, a wall-press *h*, and a dresser and table *g g*. There is a stair at *c* to the servants' and other apartments above, and which also leads to the principal bedrooms in the upper storey of the house. Beyond the kitchen is the scullery *d*, which contains a large furnace-pot *e*, a sink in the window *f*, a wall-press *h*, and a dresser *g*. This apartment is 18 feet by 10 feet, and 10 in height. A door from it, and another from the kitchen, open on a lobby common to both, and which gives access by another door to the principal kitchen entrance door through the porch *p*. The porch *p*, 6 feet square, is erected for the purpose of screening both the kitchen and scullery from wind and cold, and it has a window. On going to the right from the kitchen to the kitchen-pantry *k*, is a wall-press in the passage at *s*. The pantry *k* is provided with a door; a window which should look to the east or north; a larder *l*, and abundance of shelving at *o*; it is 12 feet square, having a roof of 10 feet in height. Beyond this pantry is the milk-house or dairy *m*, having two windows also facing to the north or east; a lock-up closet *n*, and shelving *o o* around the walls; it is 18½ feet by 12, and 10 in height.

These are the different apartments on the ground-floor, and their relative posi-

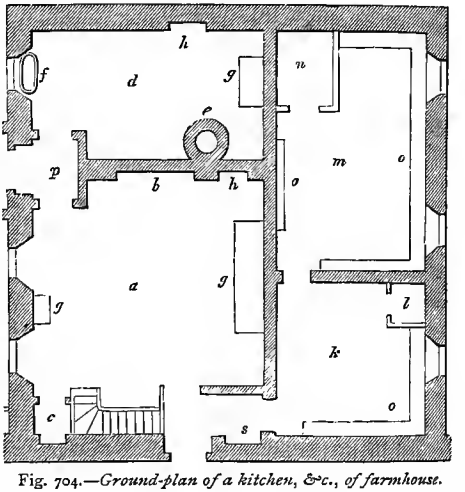


Fig. 704.—*Ground-plan of a kitchen, &c., of farmhouse.*

tions, required for conducting the business of a farm within the house, and in the fitting up of which are many particulars which require attention. The floor of the kitchen should be of *flagged pavement polished*, that it may be cleaned with certainty and ease.

In the scullery, the sink *f* should be of polished free-stone, made to fit the window-void, with a proper drain from it, provided with a cesspool. The floor should be of the same material as that of the kitchen, for the sake of cleanliness.

The large furnace-pot *e* should be built

in with fire-brick, surrounded with common brick, plastered and protected with cloth on the outside, rubbed hard into the plaster, and the mouth of the pot protected with a 4-inch thick pavement polished. To carry off the superfluous steam, a lead-pipe should be fastened into a narrow immovable portion of the pot-lid, and passed through the wall into the flue. A tin pipe soon rusts and wastes.

Milk-house.—The outside walls and ceiling of the milk-house *m* should be lathed, and the walls and roof plastered. The flooring should be of polished pavement, for the sake of coolness. The windows should be protected in the movable part with fly zinc-gauze, which is much better than wire-gauze; and the side and door of the lock-up closet *n* should also be lined with zinc-gauze. The best shelving for a milk-house is marble, and though this substance may appear extravagant in a farmhouse, the price of marble is now so much reduced that it is worth the extra expense. Marble is always cool, and easily cleaned and freed of stains. Scottish marble is hard and unequal of texture. The grey-veined marble from Leghorn is therefore preferable, though the black marble of the county of Galway in Ireland is equally good; but the grey colour has a coolness and freshness about it in a dairy which the black does not possess. Polished pavement is the next best material for coolness, but it is very apt to stain with milk or butter, and the stains are difficult of removal. This shelving should be 2 feet broad, 1½ inch thick, and, to be convenient, should not exceed the height of 3 feet from the floor.

It is necessary to make the wall which separates the kitchen and scullery from the milk-house and pantry of brick or stone, to keep the latter apartments more cool, and less likely to be affected by the heat and vapour which must of necessity sometimes escape from the scullery. It would no doubt be convenient for the removal of the milk-dishes to have a door between the scullery and milk-house; but it is much better to avoid every risk of contamination from a place which must at times be filled with vapours injurious to milk—a substance which is at all times delicately susceptible of injury.

Upper Storey.—On this side of the kitchen will be observed a stair. It is 4 feet in width, and intended to lead to the storey above the kitchen-floor, as also to the upper storey of the principal part of the house. The storey above the kitchen may be subdivided in this way: let a continuation of the brick or stone wall which separates the kitchen and scullery from the milk-house and kitchen-pantry be carried up, in the form of a partition of lath and plaster, to the roof of the second storey, which may be 9 feet in height, as seen on the right of *g*, fig. 705. The wall of the kitchen-flue *b* should of course be carried up to a chimney-stack above the ridging, containing at least four flues from below, one of the kitchen fire, one of the small furnace-pot of the kitchen, one of the oven, and one of the large furnace-pot in the scullery; but there should also be one from the room above the scullery, and one from one of the rooms above the kitchen; and, to render both kitchen and scullery as wholesome by ventilation as possible, there should be a small flue from the ceiling of each to carry off heated air and vapour. The kitchen stack would thus contain six flues from below and two from above.

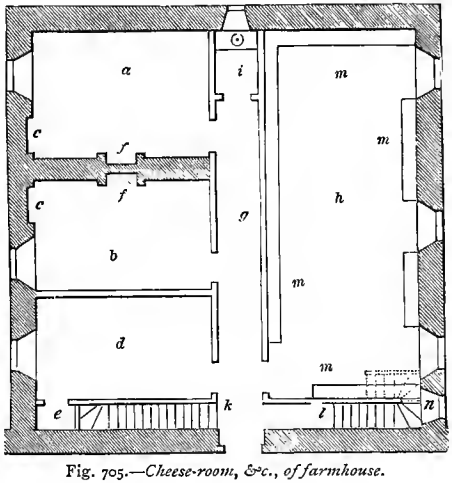


Fig. 705.—*Cheese-room, &c., of farmhouse.*

The upper storey should be partitioned off in the way as seen in fig. 705. Let the apartment *a* above the scullery be fitted up with a fireplace *f* as a bedroom for the female servants, having a closet *c* in the outer wall. After taking off a passage *g* of 3½ feet in width along the whole length of this part of the house, this room will be 14 feet by 10. The space above the kitchen may be divided into two bedrooms, one *b*, 14 feet by 9 feet, and 9 in height, with a fireplace *f* and window, and closet *c*. This might be occupied as a sitting-room and bedroom by the housekeeper, if the services of such a person are required; if not, it might be a large store-room, with a fireplace, which would be useful for various purposes. The room *d*, 14 feet by 8 feet 3 inches, and 9 in height, having a window in it, but no fireplace, might be a bedroom for occasional stranger servants. It has a closet *e* in it, 3 feet by 2 in depth.

At the end of the passage is a water-closet *i*, lighted by a window in the gable of the jamb. It is 5 feet 3 inches by 3½ feet. It has water from the same cistern that supplies the sink in the scullery, and its soil-pipe descends in an appropriate recess in the wall. Its window could give light to the passage *g* by a glass window above the door, or light might be obtained by a cupola in the roof, or from the cheese-room *h* by windows in the lath-and-plaster wall.

Cheese-room. — The entire space above the kitchen-pantry and milk-house may be appropriated to a cheese-room *h*, 29 feet 2 inches by 12 feet, and 9 in height, with 3 windows. Besides the floor, proper shelving *m m* would afford accommodation to the cheese, in its various stages towards maturity; and the lower halves of the windows provided with venetian shutters, outside the glass, to regulate the air into the room when the windows are opened. Except in dairy farms, the milk-house and cheese-room are most conveniently placed within the farmhouse.

If there is sufficient room in the roof above these various apartments for a garret, access can be obtained to it by a stair at *l*, which would have to return upon itself in ascending the 9 feet, the height of the storey; and both this stair and the one *k* down to the kitchen could be lighted by a long window at *n*. If there is no garret, then the cheese-room will be 32 feet 3 inches in length, by dispensing with the stair *l*, as also with the window *n*.

These dimensions of kitchen and other apartments would be suited to the farmhouse of a farm of from 500 to 1000 acres, under the mixed husbandry. The milk-house may perhaps be large enough for a small dairy farm; but should it be preferred in the farmhouse, and it be too small for that purpose, it might easily be enlarged by increasing the length and breadth of the building.

PLANS OF FARMHOUSES.

We now proceed to give illustrations of farmhouses of various sizes and in different styles.

First Design for First-class Farmhouse.—In fig. 706 we give a ground-plan of a first-class farmhouse: *a* the entrance-steps; *b* the ante-hall, 7 feet wide, with seat *c*; *d* library, office, or study, 12 feet square. There are two doors to this room — one, the public, entering from the ante-hall *b*, the other leading to the hall *e e*, 7 feet wide; *f f* drawing-room, 20 feet by 16; *g g* the dining-room, 20 feet by 16; *h h* store-room, 16 feet by 12; *i i* stairs to second floor, 3 feet 6 inches wide; *k k* kitchen, 16 feet square; *l* kitchen-pantry, 10 feet 6 inches by 8 feet; *m m* milk-house, 25 feet by 16, with closet *n*, 8 feet by 5 feet 6 inches. A lift *o* is placed in this closet, by which articles are conveyed to the cheese-room above; *p p* scullery, 14 feet by 8 feet 6 inches, with pantry *q*, wash-boiler *r*, and slop-stone *s*. The back stairs to servants' bedroom are at *t t*; *u u* a passage, 3 feet wide, leading to back-entrance *v*; *w* a water-closet, 3 feet 6 inches wide.

In the upper floor, fig. 707, *a a*, *b b* are the principal bedrooms, 20 feet by 16; *c c* small bedroom, 12 feet square; *d d* nursery, 16 feet by 12; *e* linen-closet, 7 feet square; *f* water-closet, 3 feet wide; *g g* servants' bedroom, 16 feet square; *h h* cheese-room, 33 feet 9 inches by 16 feet; *i* lift: *k k* roof of scullery.

Fig. 708 shows an alternative arrangement of part of chamber-floor storey, in

which *a* corresponds with *g g*, fig. 707; a passage *b* being taken off it, to give entrance to a bedroom *c* built over the scullery *k k*, fig. 707, or *p p* and pantry *q*, fig. 706; *d* cheese-room; *e* a room.

In Plate VIII., fig. 1, we give a drawing of front *elevation* in the Tudor Gothic style; fig. 3 being an alternative design in the Italian style; fig. 2 being a second alternative design, adapted for three storeys, in the Tudor Gothic style.

In fig. 709 we give a side elevation (left hand in plan fig. 706); in fig. 710 back elevation (along the back of the plan, fig. 706); in fig. 711 side elevation (right-hand side of plan in fig. 706),

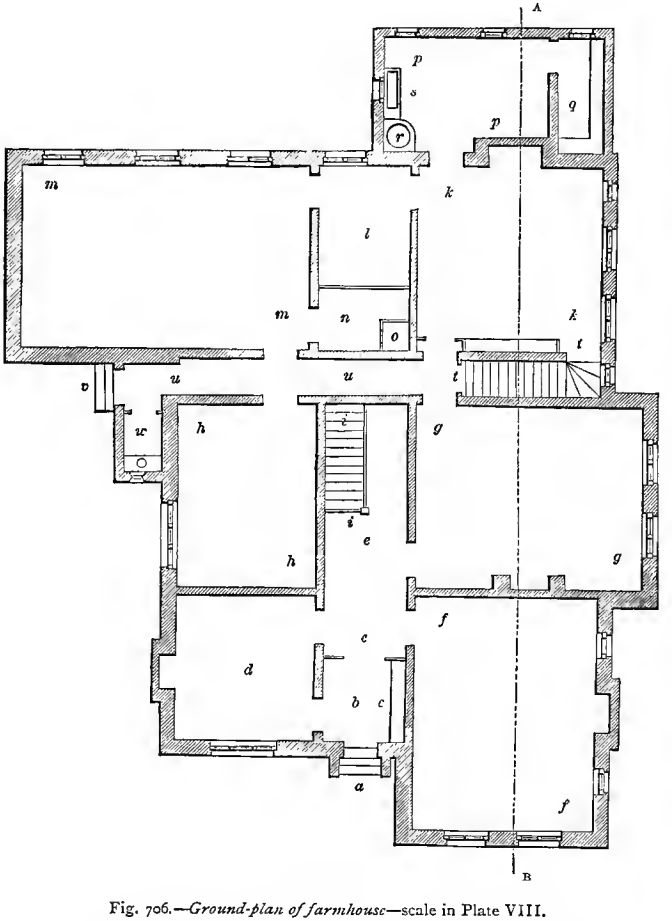


Fig. 706.—*Ground-plan of farmhouse*—scale in Plate VIII.

finished to show stone-rubble walling; in fig. 712 back elevation of alternative design in same style as fig. 3, Plate VIII.; in fig. 713 a vertical section of milk-house *m m*, fig. 706, and above it cheese-room *h h*, fig. 707.

Second Design for First-class Farmhouse.—In fig. 714 we give ground-plan, and in figs. 715 and 716 cellar plan, and alternative cellar plan, and in fig. 717 chamber or first-floor plan of a farmhouse, designed in the Italian style, with campanile tower.

Ground-plan.—In fig. 714, *a* is the entrance-hall, 8 feet square; *b b* drawing-room, 16 feet by 12; *c c* parlour or dining-room, 15 feet by 12; *d d* the kitchen, 15 feet by 12; *e* the scullery,

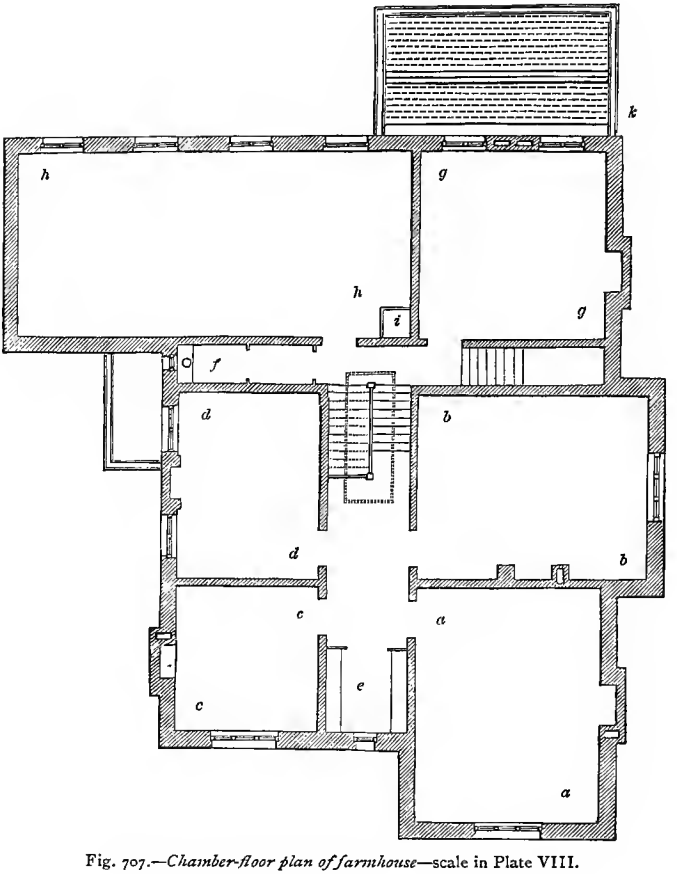


Fig. 707.—*Chamber-floor plan of farmhouse*—scale in Plate VIII.

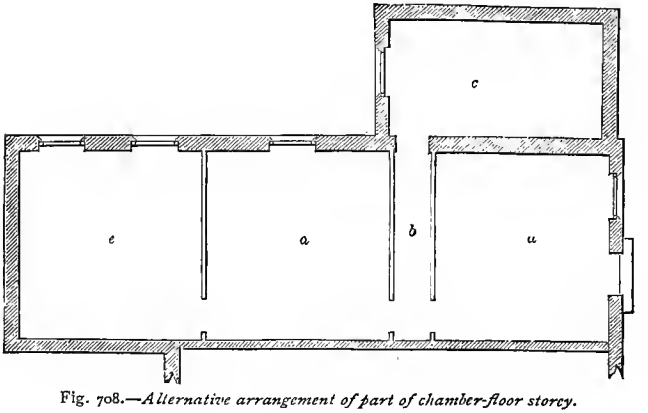


Fig. 708.—*Alternative arrangement of part of chamber-floor storey.*

Fig. 709.—*Side elevation of farmhouse*—scale in Plate VIII.

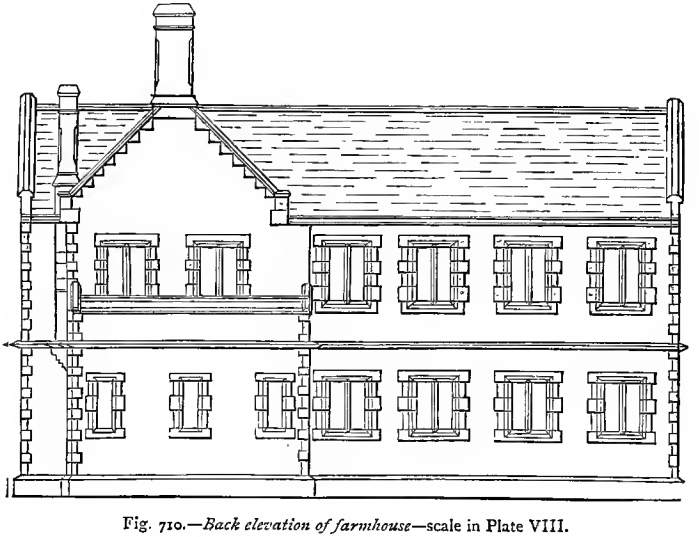


Fig. 710.—*Back elevation of farmhouse*—scale in Plate VIII.

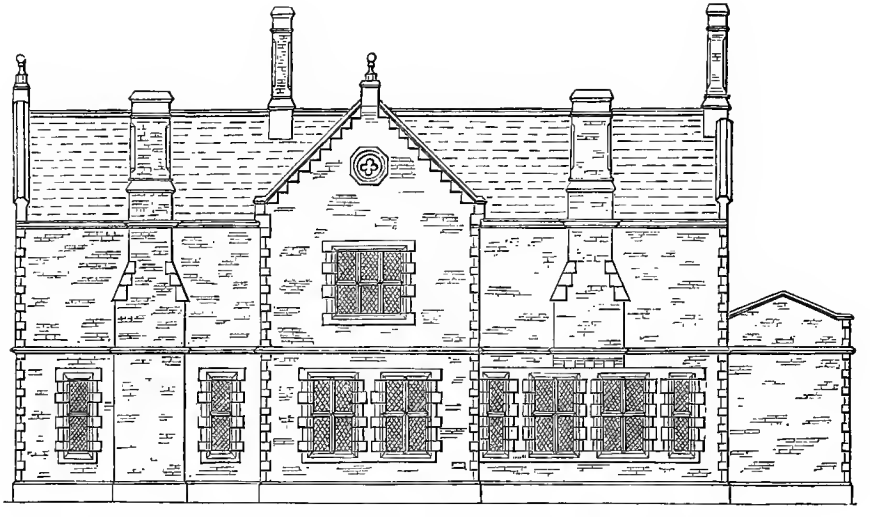


Fig. 711.—*Side elevation of farmhouse, finished to show stone-rubble walling*—scale in Plate VIII.

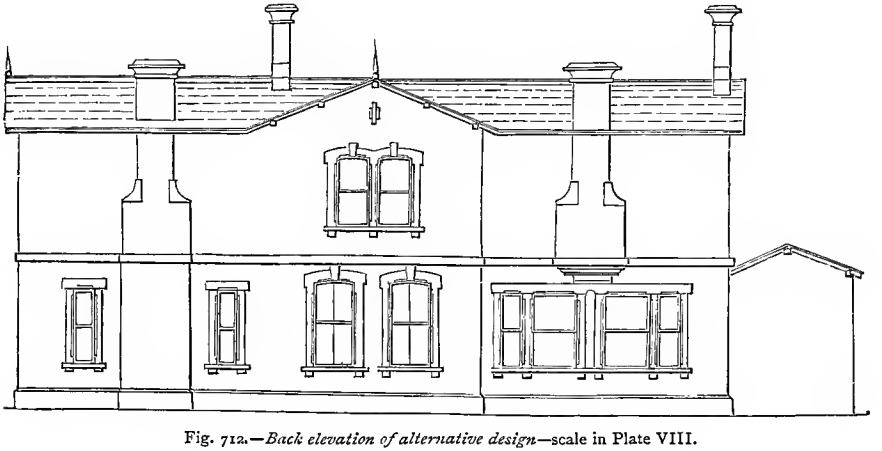


Fig. 712.—*Back elevation of alternative design*—scale in Plate VIII.

12 feet by 10; *f* the larder, 6 feet square; *g* the china-pantry, 6 feet square; *h* the central lobby, 4 feet wide; *i i* staircase, 6 feet wide; *k* water-closet and place for hats, 3 feet wide; *l l* milk-house, 25 feet by 12; *m m* cheese-room, 25 feet by 12.

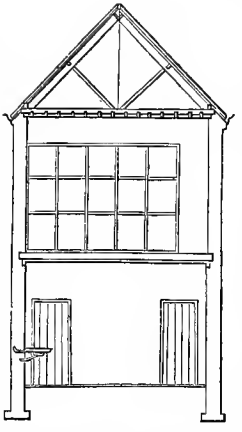


Fig. 713.—*Vertical section of milk-house and cheese-room*, figs. 706 and 707.

Cellar Plan.—Fig. 715 shows the cellar arrangement under the kitchen, where the "cheese-room" and "milk-house" are not in the ground-floor, and where *a* is the stair, 3 feet wide; *b* the coal-store, 9 feet by 5 feet 6 inches; *c* the beer and wine store, 9 feet by 5 feet 6 inches; *d d* milk-house, 24 feet by 11. In this arrangement the bedroom *d*, fig. 717, is taken as the cheese-room. In fig. 716 the cellar plan is shown as under the milk-house *l l*, and cheese-room *m m*, fig. 714. In fig. 716 the part *a a* is arranged, as in fig. 715, with coal and beer stores, as there indicated; *b b* being a general store-cellar.

Chamber Plan.—Fig. 717: *a a* bedroom, 12 feet square: *b* balcony; *c c* bedroom, 15 feet by 12; *d* bedroom, 12 feet by 11; *e e* bedroom, 12 feet by 10 at widest, and 6 feet at narrowest part; *f f* bedroom, 12 feet by 10; *g* bath-room, 8 feet square; *h* balcony.

Elevations and Section of Farm-

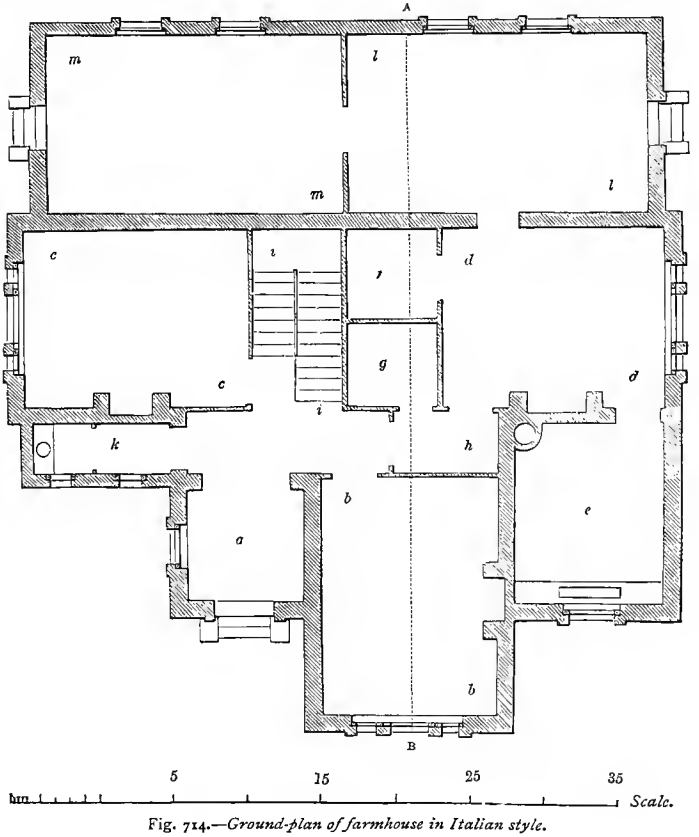


Fig. 714.—*Ground-plan of farmhouse in Italian style.*

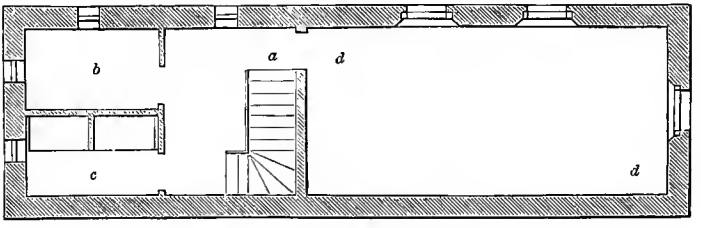


Fig. 715.—*Cellar plan*—scale in fig. 714.

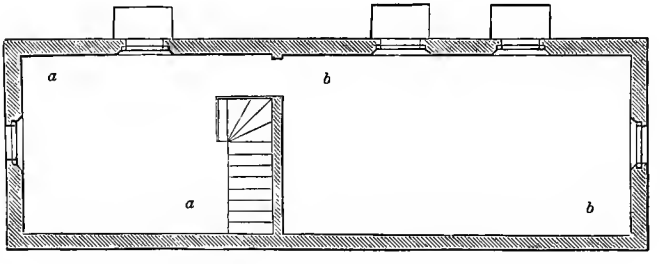


Fig. 716.—*Alternative cellar plan*—scale in fig. 714.

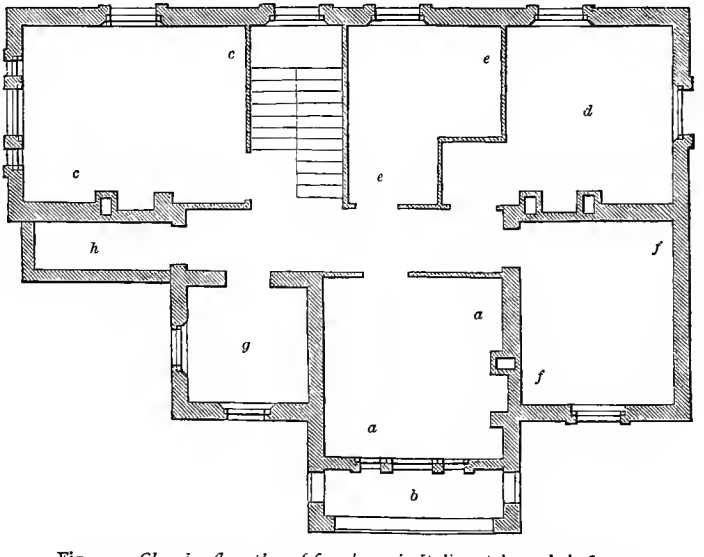


Fig. 717.—*Chamber-floor plan of farmhouse in Italian style*—scale in fig. 714.

Fig. 718.—*Front elevation of farmhouse in Italian style*—ground-plan and scale in fig. 714.

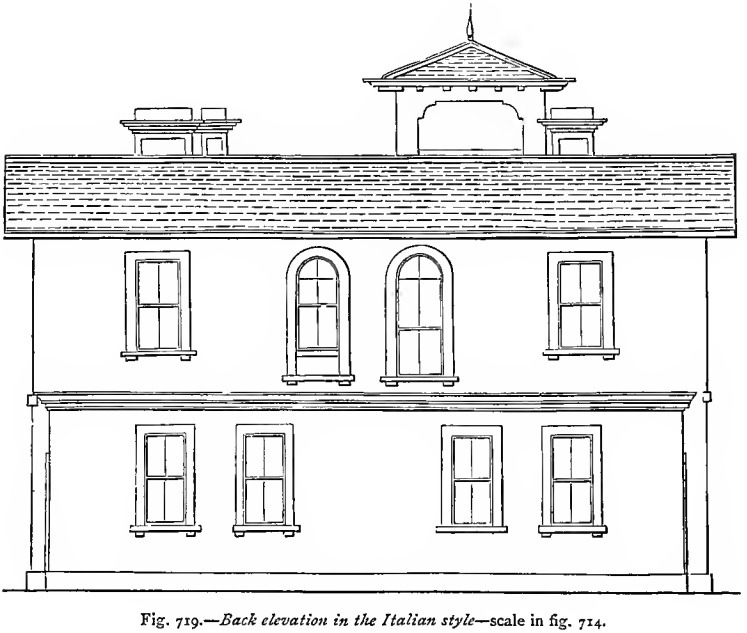


Fig. 719.—*Back elevation in the Italian style*—scale in fig. 714.

Fig. 720.—*Side elevation in the Italian style*—scale in fig. 714.

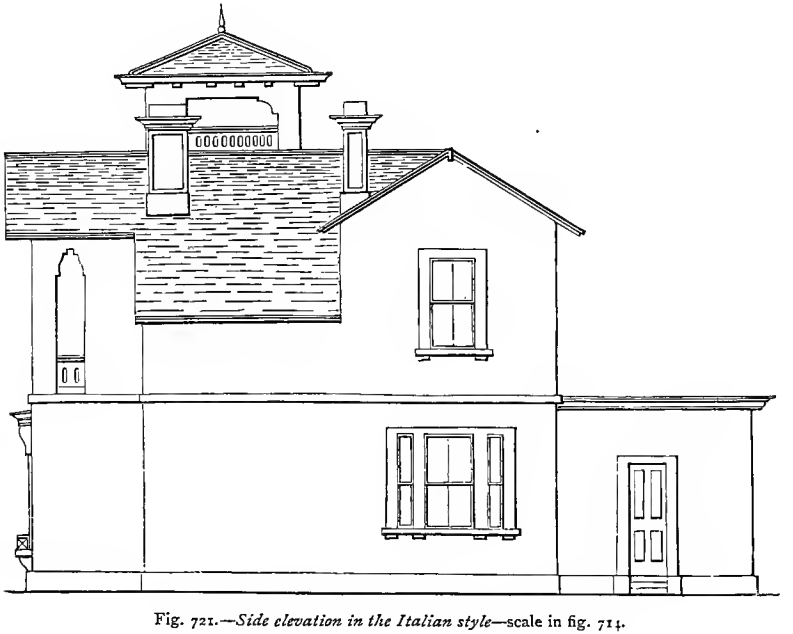


Fig. 721.—*Side elevation in the Italian style*—scale in fig. 714.

house, of which plans are given in figs. 714, 715, 716, and 717.—Front elevation in fig. 718; back elevation in fig. 719; elevation of side towards left hand in ground-plan, fig. 714, is given in fig. 720; the elevation of side towards right hand in plan, fig. 714, is given in fig. 721. The scale to which these drawings are constructed is given in fig. 714.

Outline and Ornamentation.

It may be objected to the designs which we have given for first-class farmhouses that they are too ornate, and would involve in their erection a far greater sum than the ordinary circumstances of farming economy would warrant or justify. While conceiving it to be our duty to give each design complete, with the peculiar ornament fitted to its style—leaving this to be adopted or not as desired—we have endeavoured to meet the above objection by giving plans in which the picturesque effect, which should be striven after in all rural structures, can be obtained by the *outline* of the buildings, rather than by the ornaments by which their exteriors may be decorated. It is possible, nay, a matter of easy attainment, to erect a house in which large sums may be expended in the exterior decoration of its doors, windows, &c., and yet a bald, tame, and anything but picturesque effect will be produced; while, on the other hand, a house may be erected with its exterior positively destitute of decoration, and yet presenting to the eye of the beholder a pleasing picturesqueness of outline. In the one case, the outline or general design of the building has been bald and tame—tea-box fashion, so to speak — attributes which no amount of external decoration could overcome; while in the other case, general design has been calculated to produce a picturesque effect — by the variety of outline or projection calling into existence the effect of light and shade—which the lack of ornament does not diminish, and yet, if added thereto, it would at the same time be perfectly appropriate, and tend to give the house a more perfect because more finished appearance.

The minimum of internal accommodation being determined on, it may be considered as axiomatic that a picturesque outline which will embrace this accommodation will be obtained as cheaply, at least very nearly so, as one which in its tameness will ever be a blot on the landscape and an eyesore to the man of taste. A pleasing building does not depend on its external decoration for effect, but, as we have already said, upon its general design or variety of outline. The external decoration appropriate to the style doubtless gives a finish to the building, but it may be dispensed with without in any degree marring the effect of the structure.

Second-class Farmhouse.

The drawings which follow here illustrate the arrangements and decoration of a farmhouse giving less accommodation than those preceding.

Ground-plan, fig. 722.—*a* entrance-lobby, 6 feet wide; *b b* dining-room, 16 feet by 14; *c c* parlour, 13 feet by 12 feet 6 inches; *d d* kitchen, 14 feet 6 inches by 12 feet 6 inches; *e* scullery, 10 feet by 9; *f* pantry or store-room, 9 feet by 5 feet 3 inches; *g* stair, 3 feet wide; *h* back-passage, 3 feet 4 inches wide.

Cellar Plan, fig. 723.—*a* stair, 3 feet wide, entered from the back-passage *h*, fig. 722, by a door at the point *i*; *b* the landing-place, 6 feet wide; *c c* beer and wine cellar, 13 feet by 12 feet 6 inches; *d d* store or general cellar, 16 feet by 14 feet.

Chamber or First Floor Plan, fig. 724.—*a a* principal bedroom, 16 feet by 14; *b b* bedroom, 13 feet by 12 feet 6 inches; *c* linen-closet, 6 feet by 7 feet 6 inches; *d d* nursery or back bedroom, 14 feet 6 inches by 12 feet 6 inches, with closet *e*, 3 feet by 4 feet 9 inches; *f* servants' bedroom, 12 feet 6 inches by 9 feet; *g* closet, 3 feet by 4 feet 3 inches; *h* water-closet or bath, 6 feet by 3 feet 4 inches.

Elevations.—Fig. 725, front elevation; fig. 726, side elevation towards apartments *c* and *d* in fig. 722; fig. 727, side elevation towards apartments *b*, *h*, and *f* in fig. 722.

Third-class Farmhouse.

In fig. 728 we give ground-plan, and in fig. 729 chamber plan, of two-storeyed small farmhouse.

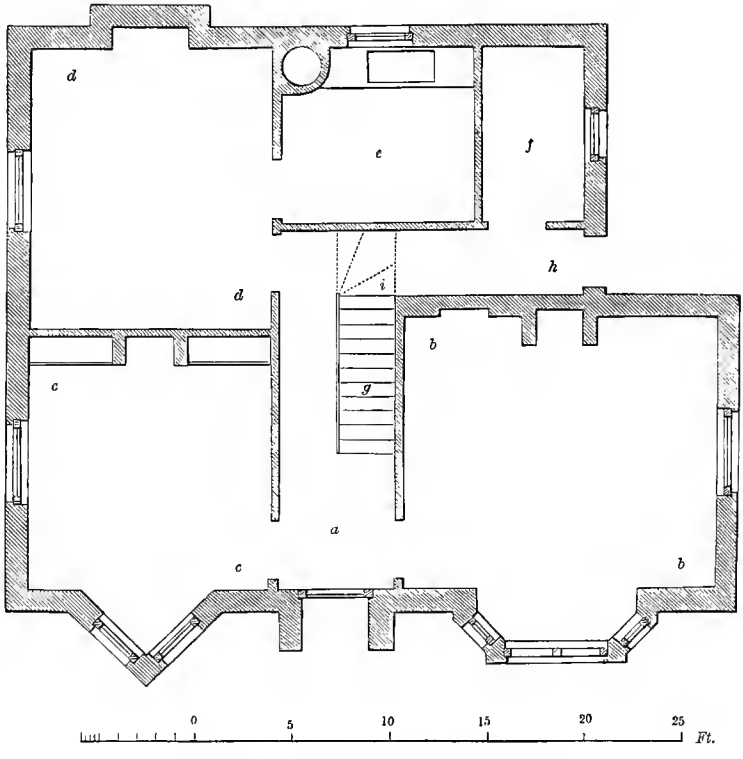


Fig. 722.—*Ground-plan of a second-class farmhouse.*

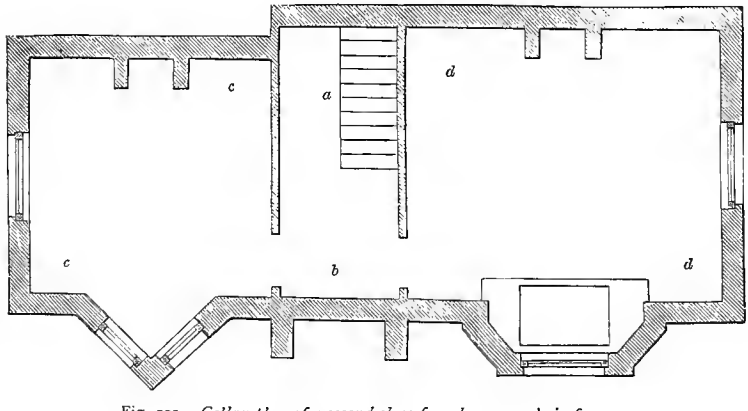


Fig. 723.—*Cellar plan of a second-class farmhouse*—scale in fig. 722.

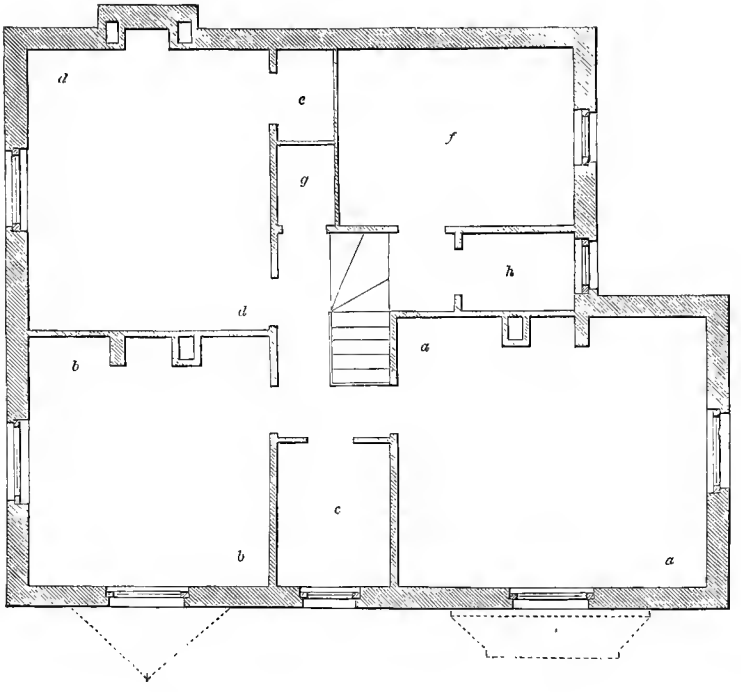


Fig. 724.—*Chamber plan of a second-class farmhouse*—scale in fig. 722.

Fig. 725.—*Front elevation of a second-class farmhouse*—scale in fig. 722.

Fig. 726.—*Side elevation of a second-class farmhouse*—scale in fig. 722.

Fig. 727.—*Side elevation of a second-class farmhouse*—scale in fig. 722.

Ground-plan, fig. 728.—*a* entrance-passage, 5 feet 6 inches wide; *b* staircase, 2 feet 6 inches wide; *c c* living-room, 14 feet square; *d d* office or parlour, 14 feet by 10 feet 3 inches; *e e* back-passage, 2 feet 6 inches wide; *f f* kitchen, 14 feet by 12; *g* scullery, 11 feet by 9; *h* pantry or store-closet, 9 feet by 4 feet 6 inches.

Chamber Plan, fig. 729.—*a a* landing-place, 5 feet 6 inches, and 2 feet 6 inches wide; *b b* front bedroom, 14 feet square; *c c* nursery, 14 feet by 12; *d d* bedroom, 14 feet by 10; *e* servants' bedroom, 11 feet by 9; *f* linen-closet, 9 feet by 4 feet 6 inches; *g* water-closet, 6 feet 9 inches by 2 feet 6 inches.

Of this house we give front elevation in fig. 730.

General Principles.

Plans of farmhouses, large and small, could be given in endless variety. Those submitted here are given more as suggestions for such structures than as perfect plans of their respective classes.

Comfort and Convenience.—Convenient arrangement of apartments, and ample room in those of them which are constantly occupied, are requisites as

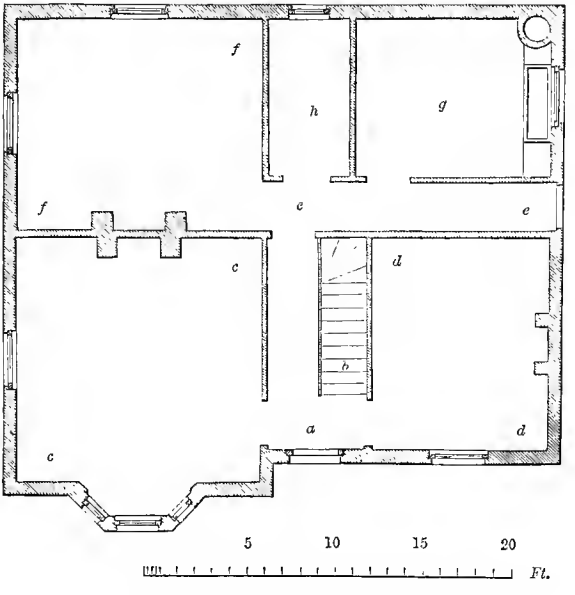


Fig. 728.—*Ground-plan of a third-class farmhouse.*

necessary in the farmhouse as in the farm steading. But how often do we see in the laying-out of a farmhouse the large space sacrificed, and the constant inconvenience in consequence experienced, by making one or two large bedrooms for the accommodation of friends who only pay a visit once a-year, or not so often. It would surely be a wiser plan that a friend who stays only a few nights should put up with a moderately sized bedroom, than that the whole family be inconvenienced for want of adequate room throughout the year.

House and Farm to Correspond.—It is a nice adaptation of things to circumstances to see the farmhouse in every respect in keeping with the extent and value of the farm. It would be quite incongruous to find a large, handsome, and ornamental house upon a poor small farm in an obscure part of the country; and it would be equally incongruous to see a mean, tasteless house set down upon a valuable farm in a rich, well-cultivated district. The former incongruity is seldom, if ever, met with; but the latter is not so rare as it should be.

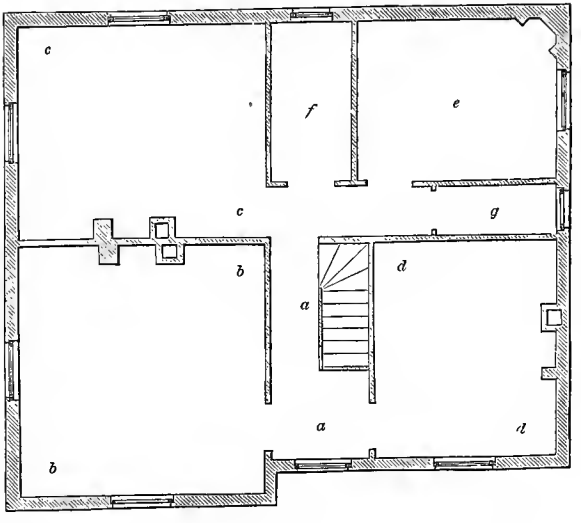


Fig. 729.—*Chamber-floor plan of a third-class farmhouse*—scale in fig. 728.

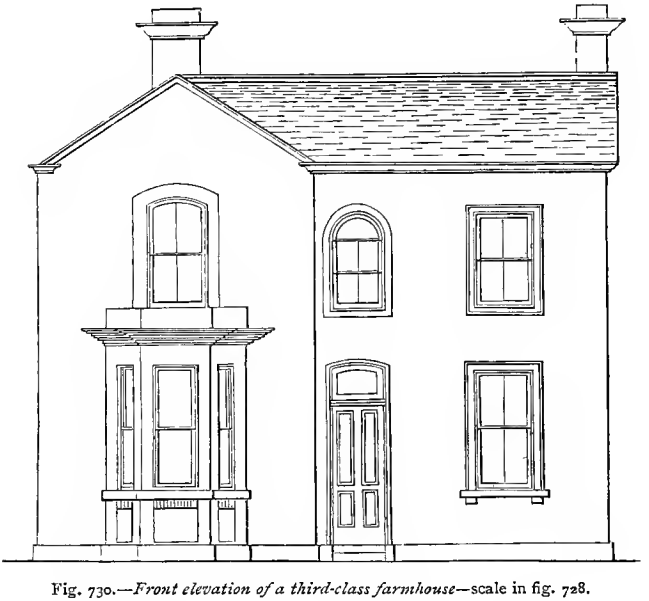


Fig. 730.—*Front elevation of a third-class farmhouse*—scale in fig. 728.

Ample accommodation in his house is due to every farmer; but a large ornate house should be provided only for farms bearing a rental of several hundred pounds per annum.

PLANS OF FARM COTTAGES.

It is gratifying to be able to say that much progress has been made in the improvement of the dwellings of farm-

labourers, although in many parts of the country much still remains to be done.

Classes of Servants.—Farm-labourers consist of two classes—those who are constantly employed in the daily operation of the farm, and those who occasionally work on a farm, but principally support themselves by independent labour. Farm-servants are stewards or bailiffs, ploughmen, shepherds, cattlemen, hedgers, and field-workers, who are hired by the year, half-year, or month, and are, or ought to be, lodged on the farm.

Residence on the Farm.—In Scotland it is almost the universal practice for servants to reside on or very near to the farm on which they are employed; but it is otherwise in many parts of England, where they have to walk long distances to and from their houses in villages, thereby inflicting an undue strain upon their physical powers. The obvious remedy for this strain is to build cottages near the steading. It has often been a source of wonder to us to what cause may be ascribed the practice of placing the dwellings of farm-servants at a distance from the scene of their labours. One should suppose that common-sense would fix the lodging of a man who has worked ten hours in the day with a pair of horses, upon the farm itself, in which he might rest his wearied body, and from which he might easily tend the animals intrusted to his care, rather than farther to fatigue him by a long journey after the labours of the day had ceased, and at the same time to remove him entirely from the animals under his charge. The payment of weekly money-wages entices the English farm-servant into the beer-shop of the village in which he dwells, rather than spend his leisure hours with his family. The Scotch farm-servant, who is paid greatly from the produce of the farm, and lives upon the spot where his horses are housed, feels a greater interest in the welfare of the farm, and has no temptation to waste his hours in imbibing liquor.

Independent labourers are hired by the day; and as the scene of their work may frequently be changed, it may be most convenient for them to live in villages.

The dwellings of both these classes of labourers may be of the same description, although it shall be our special duty to describe such arrangements in the apartments of cottages as shall be most suitable to farm-servants.

Family Cottages.

Accommodation.—While deprecating the fault of too limited accommodation, we, on the other hand, conceive it necessary to say a word against the fault on the opposite side of giving too much. A larger house than a hind can well furnish is a burden to him; and whatever part he cannot furnish becomes a dirty lumber-room, or is let to some stranger in the capacity of a boarder—a very objectionable class of persons on any farm. A house that will just accommodate the number of persons of his household is what the servant wants.

Cottages of Different Sizes.—This object can be attained only by building cottages of different sizes. The usual practice, when building cottages for farm-servants, is to adopt a uniform plan, upon which all are built. The practice is not founded upon sound principle, nor even on consistency, because it implies that families consisting of very different numbers should, nevertheless, be accommodated with similar spaces. Instead, therefore, of a family accommodating itself to the size of the cottage, the cottage ought to be adapted to the size of the family; and there is no way of fixing the proportions between the cottages and their inmates but by building them with different extents of accommodation for families of different numbers. This is the only rational course to pursue, and, in pursuance of it, it is as easy to build a given number of cottages on different plans as on the same plan.

Following out this principle, we shall give a number of plans, suited to families of different sizes, taken from practical examples, but modified in some instances to suit our own notions of the conveniences, comforts, and means of cleanliness which such dwellings should possess.

Single-roomed Single-storeyed Cottages.—Objections have been made to accommodating a family in one room. The force of the objections entirely depends upon the number of the family. In some parts of the country the ser-

vant's family may consist of himself and wife only, in which case a single room and a single bed will suffice for their accommodation. In other parts the servant is obliged to supply the farmer with a female to work in the fields, when a bed must be procured for her. In this case, at least two beds are required in the house; and even these may be accommodated in one room.

Fig. 731 shows the manner of accommodating two beds in one room: *a* is the door of entrance; *b* the porch; *c* the door into the room *d*; *e* is the fireplace; *f* the window of the room; *g* the plate-rack for holding the crockery, &c.; *h* the dresser; *i* and *k* are the two beds, *i* entering from the room *d*, and *k* from the small room *n*, provided with a window, which is divided by a partition between this room and the store-room *l*, which is entered from the porch by the door *m*. The apartment *n* has a door hinged on the corner of the bed *k*, if a box-bed, and on the wall if not so.

If the beds are box-beds, which is the most common form, the inmates at night

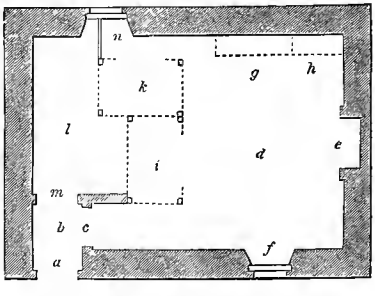


Fig. 731.—*Ground-plan of a small hind's house of one room.*

will be sufficiently separated, the married couple entering the bed *i* from the apartment *d*, and the field-worker *k* from the small chamber *n*. Should the beds be of the tent-bed form, with curtains, farther separation might be effected by a wooden partition between the two beds, and at the ends of *k* next *l* and *d*, and at the back of *i* next *l*. Such a cottage measures 22 feet in length, and 15 in breadth—giving the floor of *d* a space of 15 feet by 11½, which is enough for three adult persons.

Even three beds might be accommodated in one room, as shown in fig. 732, where *a* is the entrance-door; *b* the porch; *c* the door of the apartment *d*; *e* the fireplace; *f* the window of the room; *g* the plate-rack; *h* the dresser; *i m n* are three beds, so arranged that *m* enters from the room *d*, *i* from the small closet entered by the door *l*, and

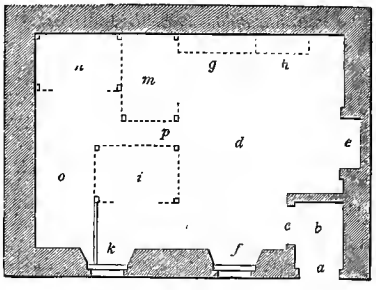


Fig. 732.—*Ground-plan of a large hind's house of one room.*

having the window *k* divided between it and the store-room *o*, which is entered by the passage *p*, where is a door, and has a bed in it, *n*. Box-beds would make a complete separation of their occupants by being so arranged. Tent-beds would require wooden partitions to separate *m* from *n*; and *i* would require one along the back next *p*, and at the end next *o*. If this cottage were of the same size as fig. 731—that is, 22 feet by 15—the room *d* would be equally large, but that the lobby *b* is taken off it, to make up for which the size should be extended 26 feet in length, and 15 in breadth.

Box-beds.—Box-beds are objected to by medical men, as they are too confined and inconvenient in form when any of the family are sick. Modifications in their form may be effected, chiefly by having the back and ends to open on hinges, and the top made movable, to promote ventilation, as well as to allow freer access to the patient. Curtains suspended from movable rods, made to draw forward in front, instead of sliding panels, have been recommended, to screen the person dressing and undressing, when the beds do not occupy separate apartments; but were the beds arranged in the manner represented in figs. 731 and 732, such a contrivance with the curtains would not be required. It is questionable, however,

that box-beds will be voluntarily relinquished by farm-servants, and certainly not so until every cottage is accommodated with fixed beds or separate bedrooms; and if the fixed beds have the

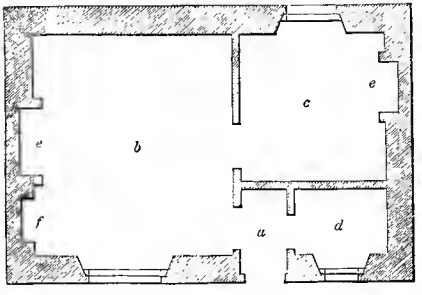


Fig. 733.—*Ground-plan of a small hind's house with two rooms.*

alcove form, which most of them have, they are equally inconvenient for a sick patient as the box-bed itself.

Separate Rooms.—But it must be owned that, where more than one bed is required in a servant's house, a separate room for it is better than any arrangement that can be made with the beds within one room, and the feeling of security and separation is more satisfactory in the second apartment. Fig. 733 gives the ground-plan of such a cottage, where *a* is the entrance-porch, 3 feet 3 inches by 4 feet 9 inches; *b* the apartment, 15 feet by 14, with a window; *c* the bedroom, 10 feet square, with a window; *d* a light pantry, 4 feet 9 inches by 6 feet 6 inches; *e e* are fireplaces, 4½ feet by 3½ feet; and *f* a wall-press, 3 feet wide. One bed can stand against the back wall of *b* for the hind and his wife, and another if required for two children; and one bed might be put into the room *c*, for the field-worker, and another for two children, if required. Thus three adult persons can well be accommodated in such a house, along with four children, if required.

In such a house as fig. 733 tent-beds and curtains would look neat and be

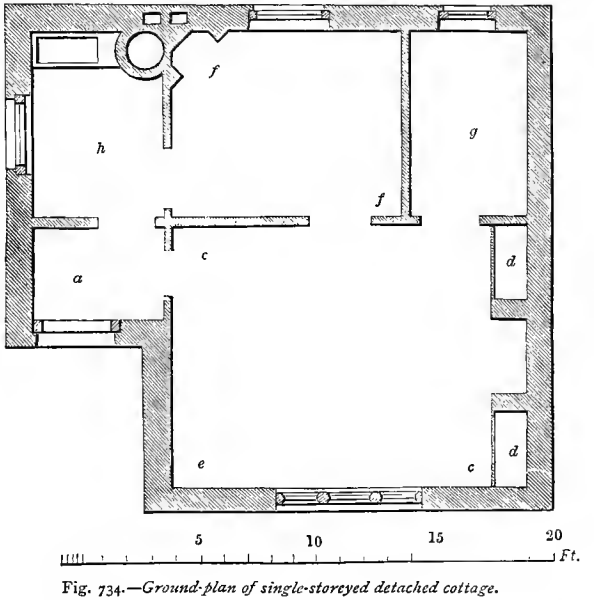


Fig. 734.—*Ground-plan of single-storeyed detached cottage.*

appropriate. Iron bedsteads are now quite common, and, for convenience of putting up and taking down, and avoiding fracture, they are much better adapted for hinds than wooden ones. They also possess the advantage of giving no shelter to bugs. The curtains of beds to be used in such houses ought to

be made of wool to resist fire, and not of cotton, which would, in the circumstances, only be a little less dangerous than a covering of tinder.

Single-storeyed Detached Cottage.

In fig. 734 we give the *ground-plan* of a single-storeyed detached cottage: *a* the porch, 5 feet 6 inches by 4 feet; *c c* living-room, 15 feet by 11, having a cupboard *d d* at each side of the fireplace. A bed may be placed at the part *e*; *f f* bedroom (with fireplace), 9 feet 6 inches by 7 feet 9 inches; *g* a bed or store closet, 7 feet 9 inches by 5 feet; *h* scullery, with slop-stone or sink, and boiler, 7 feet 9 inches by 5 feet 6 inches.

In fig. 735 we give a *front elevation* of the cottage of which, in preceding figure, we have given the ground-plan.

Second Design.—In fig. 736 we give *ground-plan* of a cottage in which *a* is the entrance-porch, 3 feet 6 inches square;

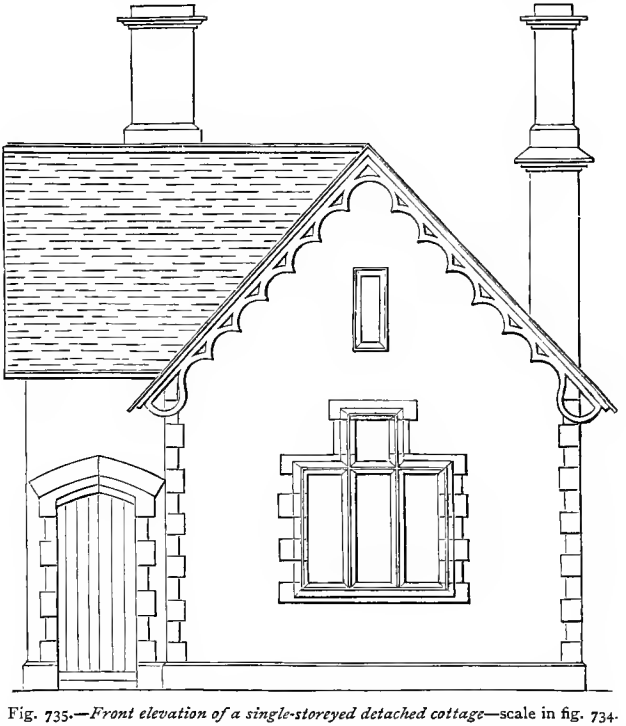


Fig. 735.—*Front elevation of a single-storeyed detached cottage*—scale in fig. 734.

b b the lobby or passage, 3 feet 6 inches wide; *c c* bedroom, 13 feet 6 inches by 12 feet; *d d* bedroom, 10 feet 3 inches by 10 feet 6 inches; *e e* nursery or bedroom, 12 feet by 9, with closet *f* off it, 3 feet 6 inches square; *g* store-room or office, 10 feet 6 inches by 6 feet; *h h* living-room, 16 feet 6 inches by 10 feet; *i* scullery, 8 feet by 3 feet 6 inches. This cottage would do for a farm-bailiff or steward.

Front elevation of this plan is given in fig. 737.

Improved Accommodation.—A more correct idea now prevails in regard to the extent of accommodation absolutely required by a farm-servant and his family. It is deemed proper that a man and his wife should have a bedroom to themselves; and as he is the head of the house, and probably works harder than any other members of the family, he should have the principal and most comfortable bedroom in the house. When a separate room from the living-room is offered him for that purpose, he prefers

to have his bed near the warm fire, that he may turn into bed with the least trouble and exposure to cold. The girls of the family must have a bedroom for themselves, and so must the boys. Thus three bedrooms at the least are required for a ploughman and his family. Moreover, if he is obliged to supply a

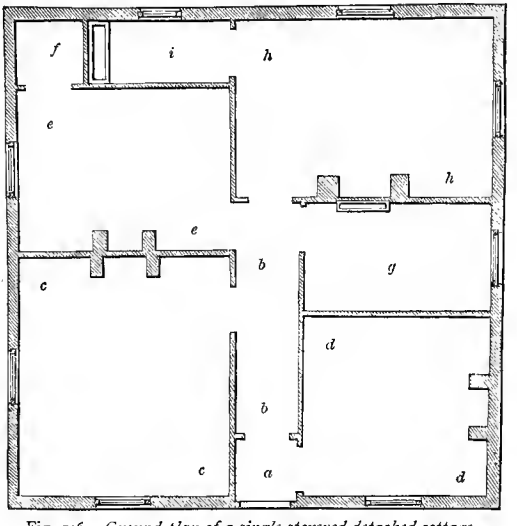


Fig. 736.—*Ground-plan of a single-storeyed detached cottage*—scale, three-sixteenths of an inch to the foot.

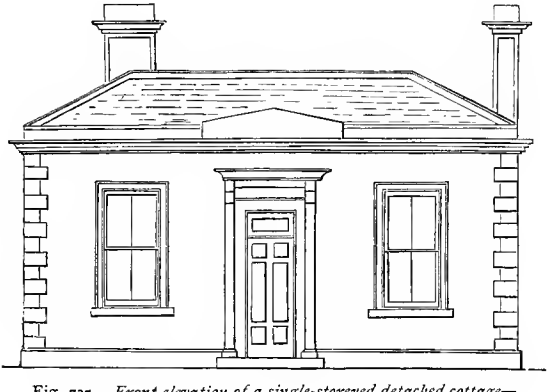


Fig. 737.—*Front elevation of a single-storeyed detached cottage*—scale in fig. 736.

field-worker for the farm, another room is required for her, for such a person is generally a woman.

Two-storey Cottages.

Such an extent of accommodation in the ground-plan would imply a large and expensive roof. A two-storey house is thus necessitated to be made, and many proprietors now prefer that plan for accommodating a large family.

It should, however, be held in remembrance that a second sitting-room in a servant's house is an unnecessary appendage to it; it will never be used as such. When in the second storey it will be converted into a sleeping-room: and when on the ground-floor, into a meal or

potato store, beside the beds that may be put into it. The fire will never be kindled in it, and it will consequently become damp and cold. It is only when the labourer is a fixed resident, holding directly under the landlord, that he will furnish his second room in the ground-floor comfortably, and warm it by occasional fires.

Design for a Two-storeyed Detached Cottage.—In fig. 738 we give ground-plan, and in fig. 739 chamber or bed-room plan of a single two-storeyed cottage.

Ground-plan.—*a* entrance-porch, 5 feet by 2 feet 9 inches; *b* a pantry or store-

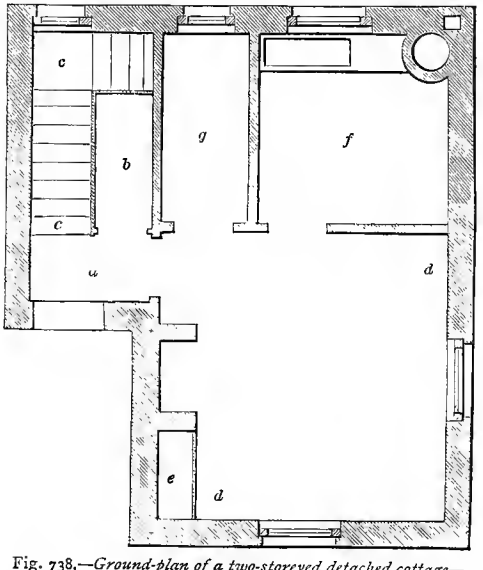


Fig. 738.—*Ground-plan of a two-storeyed detached cottage*—scale in fig. 734.

closet, 5 feet 9 inches by 2 feet 3 inches; *c c* stairs to second storey, 2 feet 6 inches wide; *d d* living-room, 12 feet square, with cupboard *e* on one side of fireplace; *f* scullery, 8 feet square; *g* store-closet, 8 feet by 3 feet 6 inches.

Chamber Plan, in fig. 739.—*a a* stairs; *b b* landing, 2 feet 6 inches wide; *c c* front bedroom, 12 feet square, with closet *d* off it, 5 feet by 3; *e e* back bedroom, 8 feet by 9 feet 3 inches; *f* linen or clothes closet, 6 feet by 2 feet 6 inches.

Front elevation of cottage, of which the preceding are the plans, is given in fig. 740. The scale to which all the figures are drawn of this example is the same as given in fig. 734.

Double-detached Cottages.—Labourers' cottages are most commonly built in long rows, and when several are required for a large farm, they frequently assume the form of three sides of a square. When outhouses are afforded, which ought always to be the case, much inconvenience is experienced by the inhabitants living in long rows of houses, in going to and from them. This row form originated, no doubt, because of a larger number of houses being erected at the same expense than in any other form, and economy of the ground taken up by them had also entered into the calculation.

For comfort and convenience combined, no form is equal to the double-detached house, having entrances at different parts, and the fireplaces in the centre of the building. Of this class of cottage we now give examples, dividing them, as in the cases of the single-storeyed detached class of cottages, into single and two-storeyed cottages.

Single-storeyed Double-detached Cottage—*Ground-plan*, fig. 741.—*a a* passage or lobby, 3 feet 6 inches wide; *b b* living-room, 12 feet by 12, with space for bed at *c*; *d* scullery, 7 feet 9 inches by 5 feet 6 inches; *e* pantry, 5 feet 6 inches by 3 feet 6 inches; *f* coal-closet, 5 feet 6 inches by 3 feet; *g* press, 3 feet by 2 feet; *h h* back bedroom, 12 feet by 11 feet six inches; *i i* front bedroom, 12 feet by 8 feet 3 inches.

Alternative Plan, fig. 742.—*a* passage, 3 feet 6 inches wide, with locker seat *b*; *c c* kitchen, 15 feet by 12 feet 6 inches, with space for bed *d*, 6 feet by 3 feet 9 inches; *e e* back bedroom, 14 feet 9 inches by 8 feet 6 inches; *f f* front bedroom, 11 feet 6 inches by 11 feet; *g* scullery, 12 feet 6 inches by 5 feet, with coal-bunker *h*.

In fig. 743 we give *front elevation* for above plans, with an alternative design in fig. 744; the front wall for this having sets-off at the points *a b*, as shown in part of the ground-plan of wall in fig.

744. The scale for all these drawings is given in fig. 741.

In fig. 744 is the *alternative front elevation* to the front elevation in fig. 743.

Alternative Plans.—In figs. 745, 746, and 747 we give alternative plans of house in fig. 741. In fig. 745 *a a* is the passage, 3 feet 6 inches wide; *b b* living-room, 14 feet by 12; *c* scullery, 7 feet 6 inches by 6 feet, with pantry *d*, entering off it, 3 feet wide; *e e* bed-closet, 8 feet 6 inches by 7 feet; *f f* back bedroom, 11 feet 6 inches by 11 feet; *g g* front bedroom, 12 feet 6 inches by 8 feet 6 inches.

In fig. 746, *a a* passage, 3 feet 6 inches wide; *b b* living-room, 14 feet 6 inches by 12 feet 6 inches; *c* scullery, 7 feet by 6 feet, with pantry *d*, entering from it, 3 feet wide; *e* bed-closet, 9 feet 3 inches by 7 feet; *f* bedroom, 12 feet by 11 feet at the broadest, and 9 feet at the narrowest part.

In fig. 747, *a a* passage, 3 feet 6 inches wide; *b b* living-room, 14 feet by 12, with *c* space for bed, 6 feet by 4 feet 6 inches; *d* scullery, 8 feet 6 inches by 6 feet; *e* pantry, 6 feet by 3 feet 6 inches; *f* back bedroom, 9 feet 6 inches by 8 feet 6 inches; *g* front bedroom, 12 feet by 11, with space for bed *h*; *i* privy; *k* coal-cellar. The scale to which figs. 745, 746, and 747 are made is given in fig. 747.

Two-storeyed Double-detached Cottages.—In figs. 748 to 754 inclusive we give drawings of two-storeyed double-detached cottages.

Ground-plan.—In fig. 748, *a a* passage, 3 feet 6 inches wide; *b b* stairs; *c c* living-room, 13 feet by 12; *d* scullery, 9 feet by 7, with back-door protected by porch *e*; *f* pantry, entering from scullery, 5 feet by 3 feet 6 inches; *g g* bedroom, 11 feet, and 7 feet wide by 10 feet 6 inches, and 7 feet long; *h* coal-cellar.

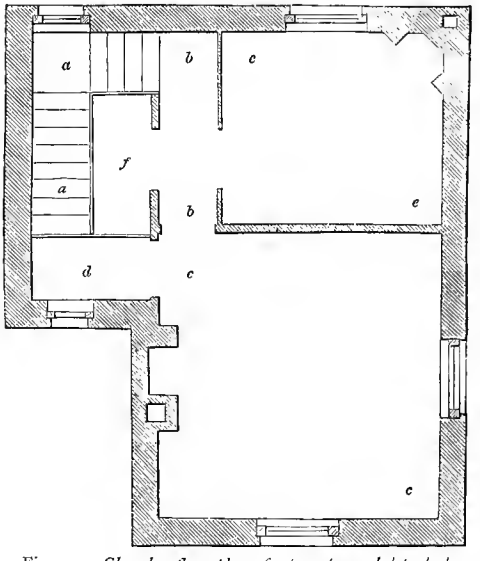


Fig. 739.—*Chamber-floor plan of a two-storey d detached cottage*—scale in fig. 734.

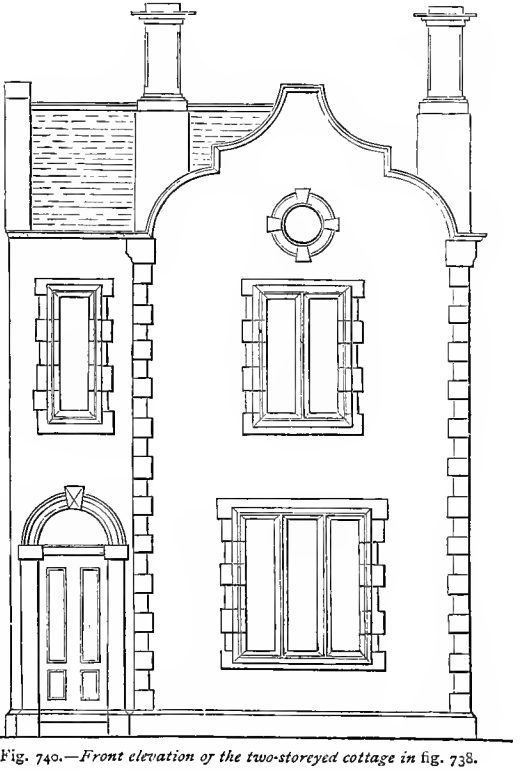


Fig. 740.—*Front elevation of the two-storeyed cottage in* fig. 738.

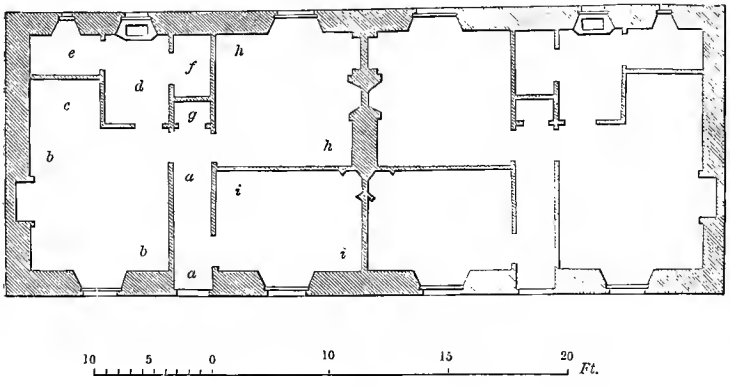


Fig. 741.—*Ground-plan of single-storeyed double-detached cottages.*

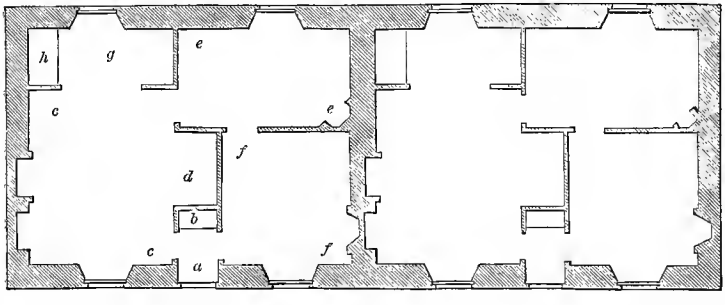


Fig. 742.—*Alternative ground-plan of single-storeyed double-detached cottages*—scale in fig. 741.

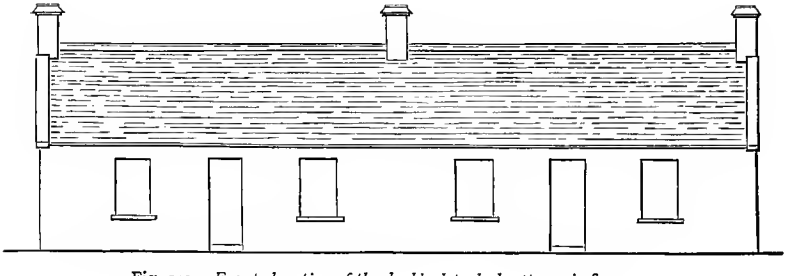


Fig. 743.—*Front elevation of the double-detached cottages in* fig. 741.

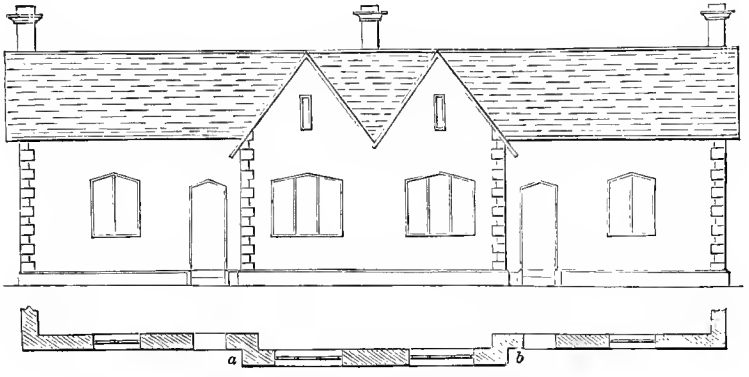


Fig. 744.—*Alternative front elevation to front elevation in* fig. 743.

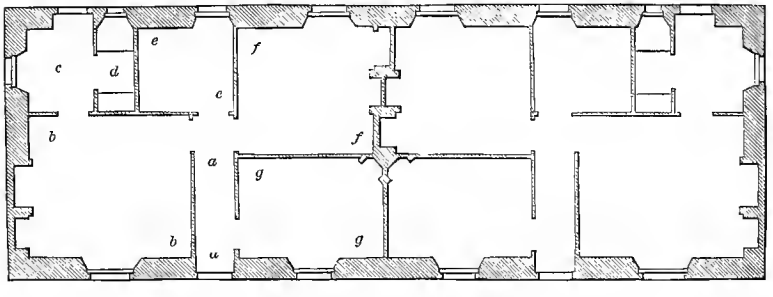


Fig. 745.—*Alternative ground-plan to ground-plan in* fig. 741.

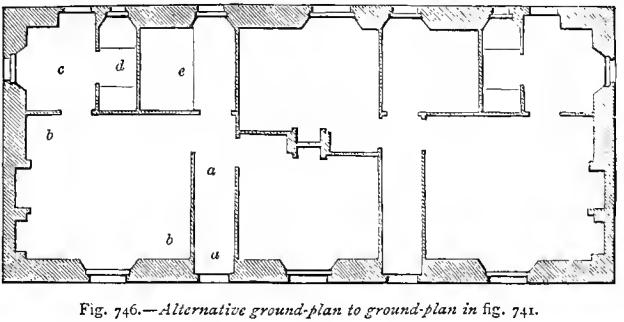


Fig. 746.—*Alternative ground-plan to ground-plan in* fig. 741.

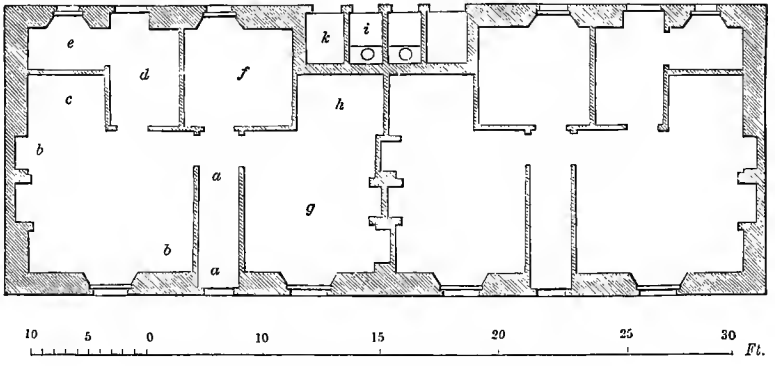


Fig. 747.—*Alternative ground-plan to ground-plan in* fig. 741.

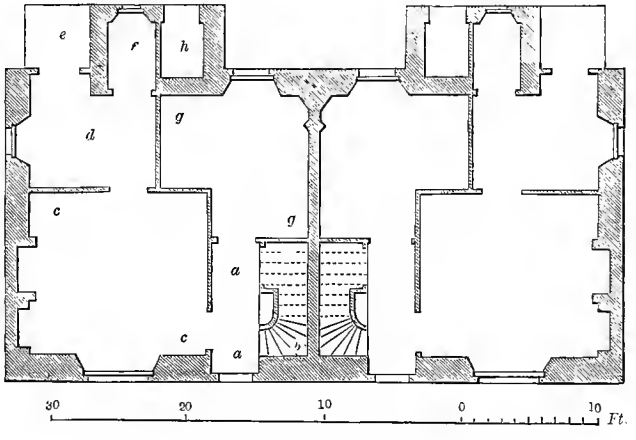


Fig. 748.—*Ground-plan of two-storeyed double-detached cottages.*

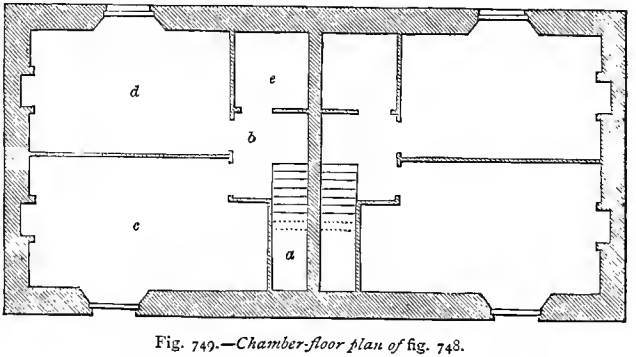


Fig. 749.—*Chamber-floor plan of* fig. 748.

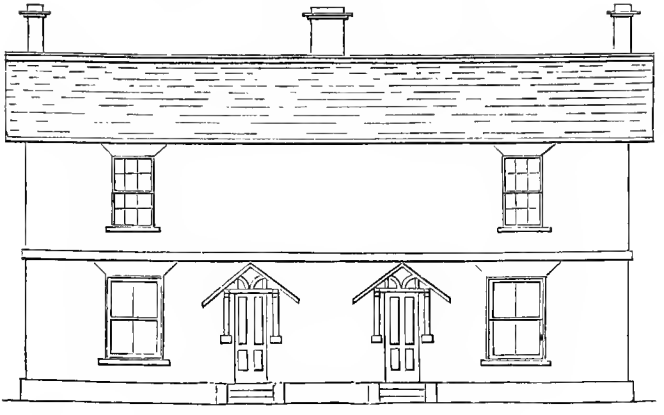


Fig. 750.—*Front elevation of the cottages in* fig. 748.

Chamber Plan, fig. 749.—*a* stairs; *b* landing; *c* front bedroom, 17 feet 4 inches by 9 feet 6 inches; *d* back bedroom, 14 feet 9 inches by 9 feet; *e* bed-closet, 5 feet 6 inches square.

In fig. 750 we give front elevation, and in fig. 751 end elevation—both adapted for brick, and rising two steps from ground-line.

Ground-plan, fig. 752.—*a* porch, 5 feet 6 inches by 5 feet; *b* stairs; *c* living-room, 15 feet by 12 feet 6 inches, with two pantries *d d* entering from it; *e* pantry, entering from scullery; *f* scullery, 7 feet by 5 feet 6 inches; *g* coal-closet; *h* bedroom, 12 feet 6 inches by 11 feet; *i* privy; *k* pig-sty; *l* ash-pit.

Chamber Plan, fig. 753.—*a* landing:

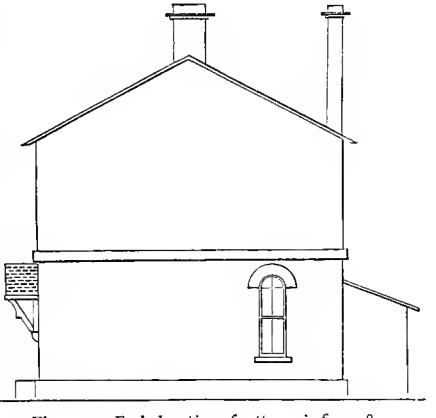


Fig. 751.—*End elevation of cottages in* fig. 748.

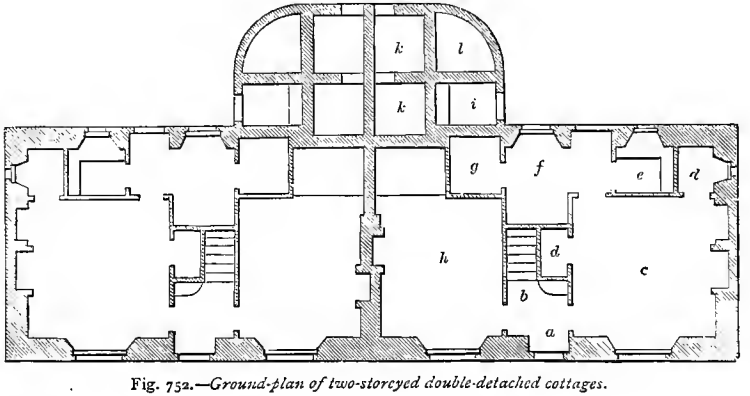


Fig. 752.—*Ground-plan of two-storeyed double-detached cottages.*

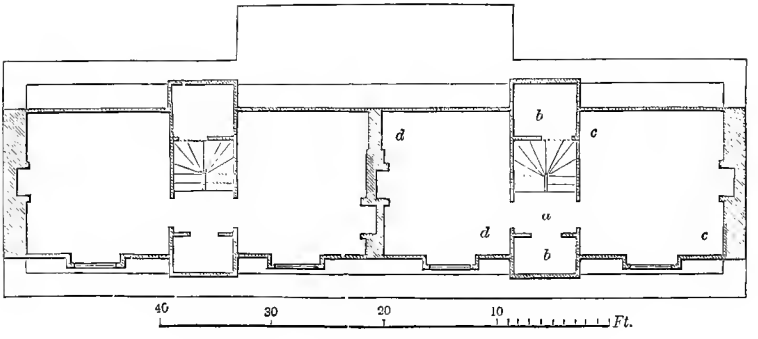


Fig. 753.—*Chamber-floor plan of* fig. 752.

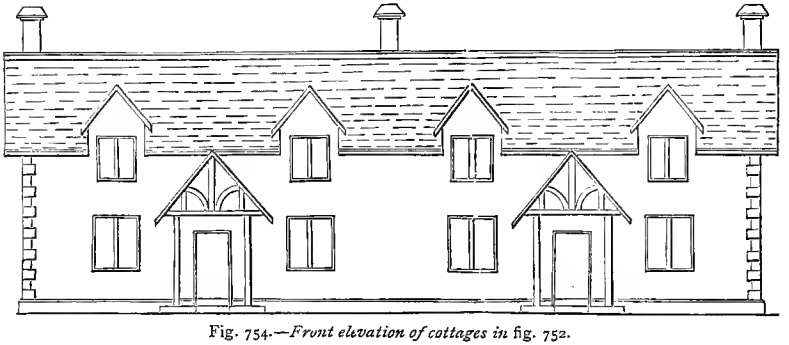


Fig. 754.—*Front elevation of cottages in* fig. 752.

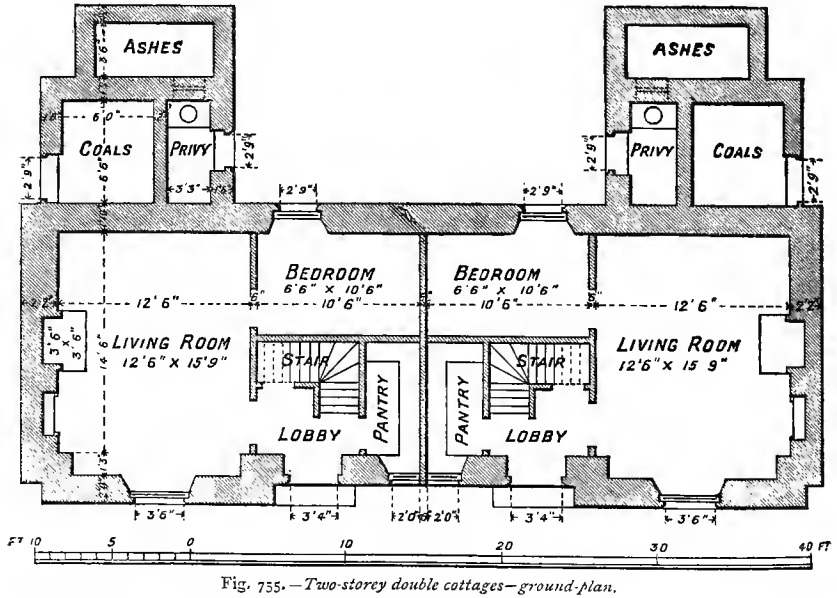


Fig. 755.—*Two-storey double cottages—ground-plan.*

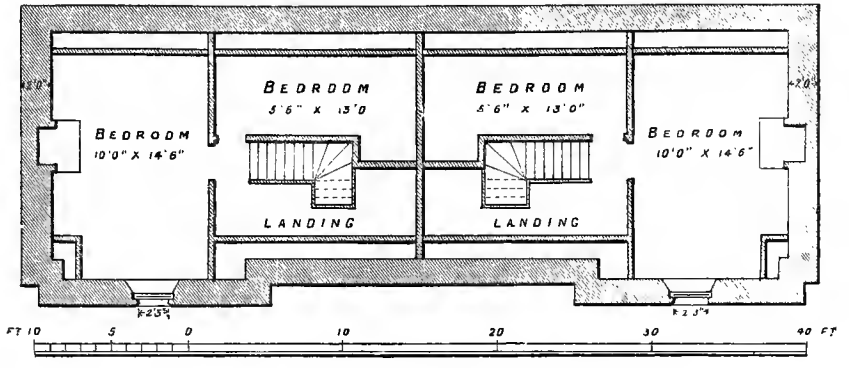


Fig. 756.—*Upper floor*

b b closets; *c c* bedroom, 13 feet square; *d d* bedroom, 13 feet by 11.

In fig. 754 we give front elevation.

Other Designs. — Fig. 755 gives the ground-plan of comfortable two-storey cottages recently erected in Morayshire. Fig. 756 gives upper floor, fig. 757 a section, and fig. 758 the front elevation. We give the specifications for the erection of these cottages — see page 389. Fig. 759 gives the ground-plan of comfortable cottages erected on Lord Harrington's property at Chatsworth, from plans prepared by Mr Gilbert

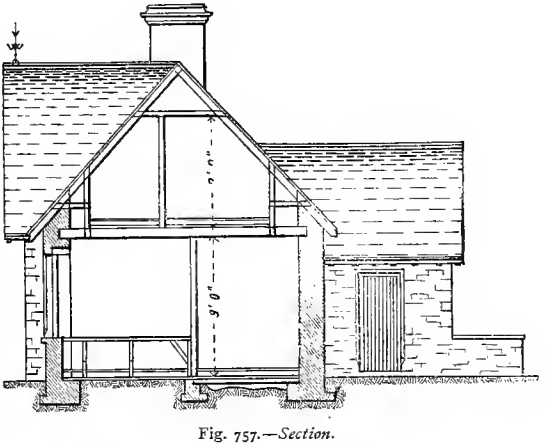


Fig. 757.—*Section.*

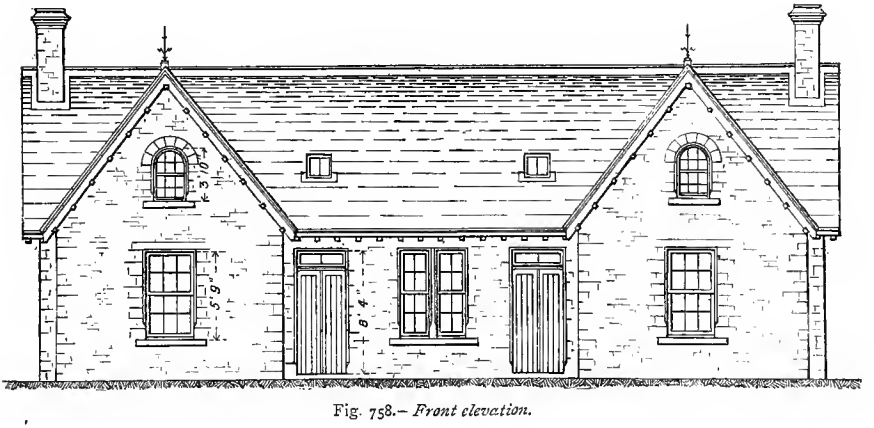


Fig. 758.—*Front elevation.*

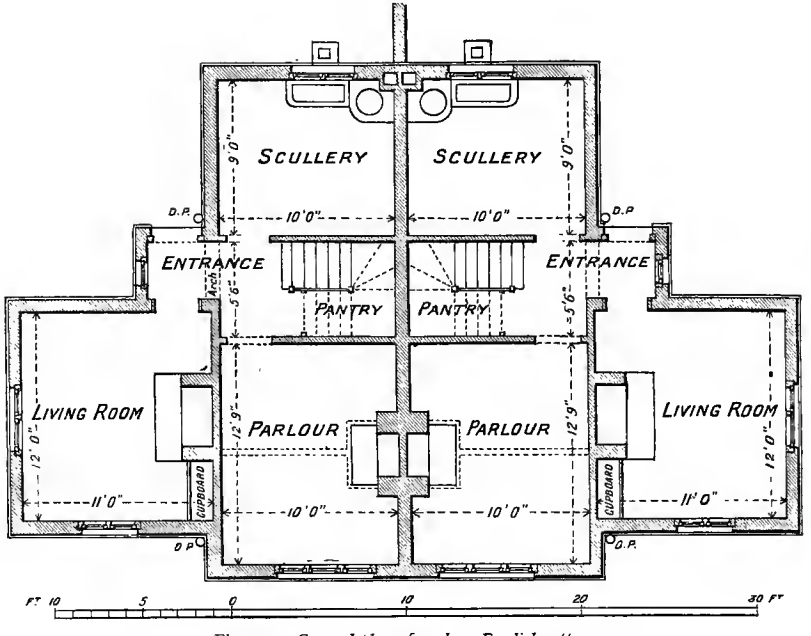


Fig. 759.—*Ground-plan of modern English cottages.*

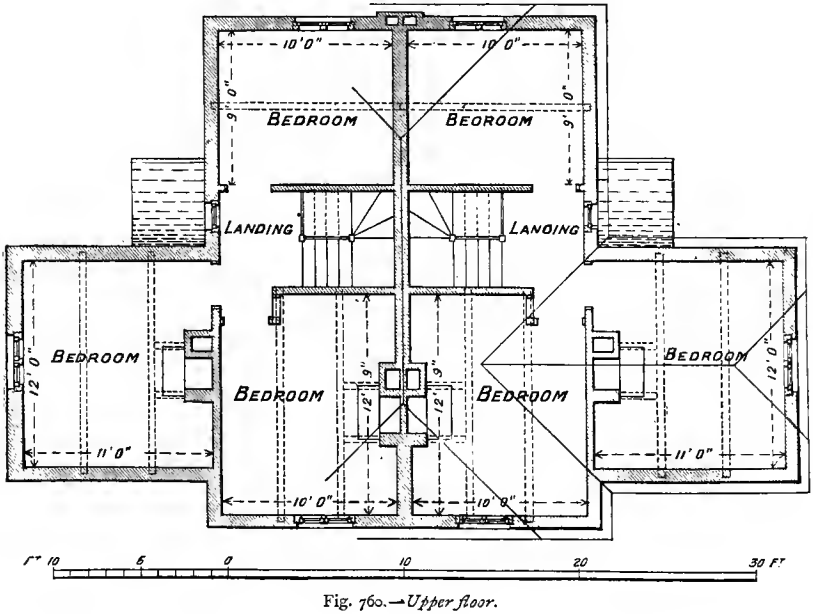


Fig. 760.—*Upper floor.*

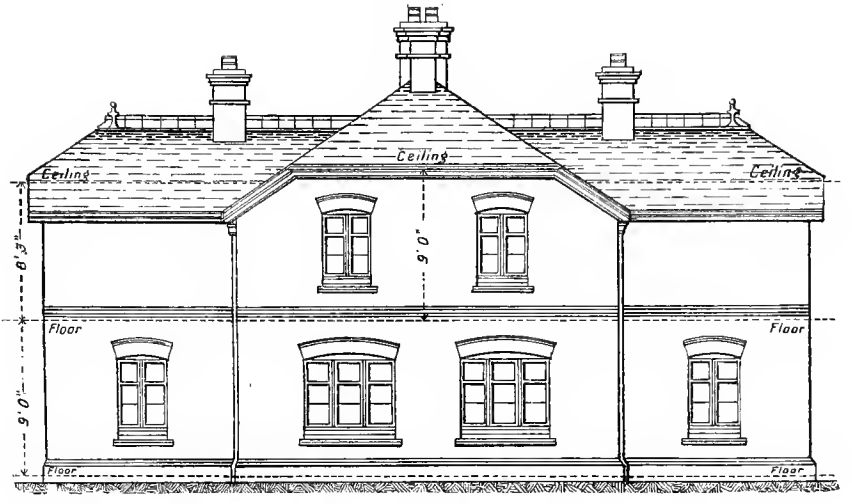


Fig. 761.—*Front elevation.*

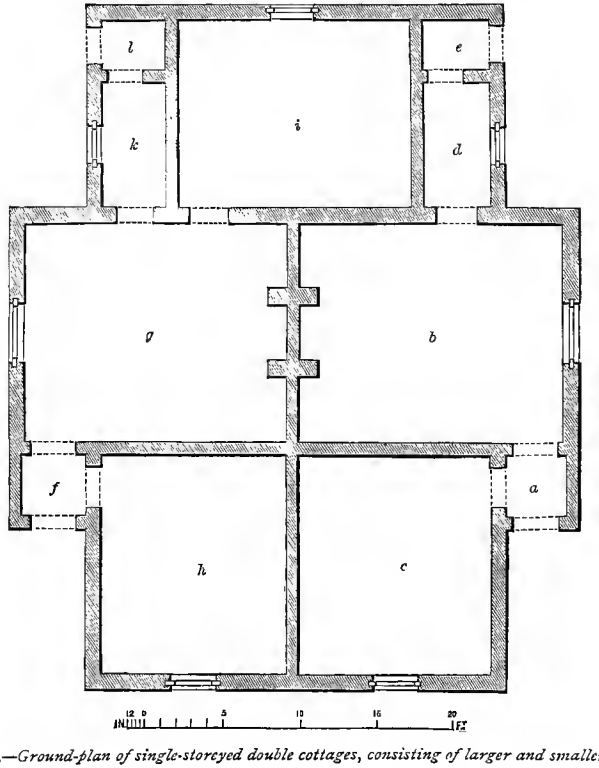


Fig. 762.—*Ground-plan of single-storeyed double cottages, consisting of larger and smaller houses.*

Murray. Fig. 760 gives the upper floor, and fig. 761 the front elevation.

Cottages of Different Sizes.

In the plans of the double cottages given above, the houses are of the same size, so that families of the same number would have to occupy the same double cottage; but as we have already said, cottages for work-people should be planned of different sizes, so that a larger or smaller family should have the cottage that best suited their number. With this view we now give plans of double cottages containing houses of different sizes; and as it is desirable that large families should not be associated together, the numbers of their persons being too many in one cottage, we have arranged the plans so as to unite a large and small house together in each cottage.

Small Single-storeyed Double-detached Cottages, with Houses of different Sizes.—In fig. 762 we give a ground-plan of such a cottage, of which on the right hand is the smaller house, where *a* is the entrance-porch, 4 feet wide; *b* the living-room, 17 feet 6 inches by 14 feet; *c* bedroom, 12 feet by 14; *d* scullery, 4 feet by 8; and *e* coal-house, 4 feet by 3.

In the larger house on the left hand, *f* is the entrance-porch, 4 feet wide; *g* the living-room, 17 feet 6 inches by 14 feet; *h* front bedroom, 12 feet by 14; *i* back bedroom, 12 feet by 14; *k* scullery, 4 feet by 8; and coal-house *l*, 4 feet by 3. It would perhaps be more acceptable to the inmates were the bedrooms *c* and *h* to enter from their respective living-rooms instead of from their respective entrance-porches.

Small Two-storeyed Double Cottages Detached, with Houses of different Sizes.—Instead of having the sleeping apartments upon the ground-floor, they may be placed in a storey above. Fig. 763 shows such an arrangement, in which *a* is the entrance-porch of a small house; *b* the staircase leading to the upper storey; *c* the living-room, entering from the porch *a*, having a window, a fireplace, and wall-press, and continning on to a back-kitchen *d*, having a window, a boiler, and a back-door. This apartment is useful for washing clothes in, and doing such things as to leave the sitting-room *c* always clean and comfortable. One large or two small bedrooms are placed over the sitting-room *c*.

A larger house has an entrance-porch *e*, fig. 763, which is also the staircase for the upper storey; *g* is the sitting-room, entering from the porch, and having two

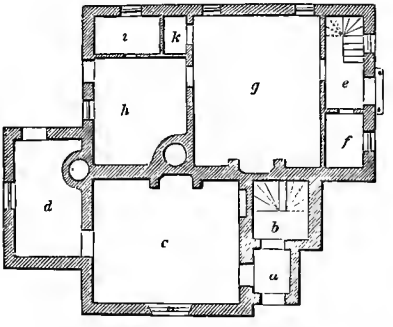


Fig. 763.—*Small two-storeyed double cottages.*

windows, a fireplace, a pantry *k*, and passing into the back-kitchen *h*, which has a window, boiler, and back-door, and enters to a light closet *i*. The light closet *f* enters from the porch *e*. Two large or three small bedrooms are placed

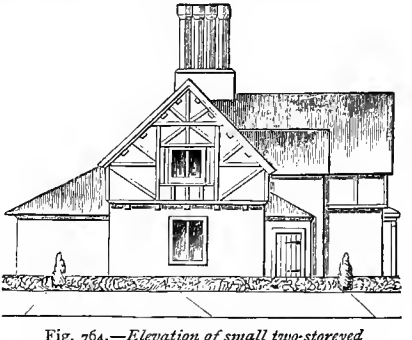


Fig. 764.—*Elevation of small two-storeyed double cottages.*

over the apartments *g* and *h* and the closets *i* and *k*.

Fig. 764 represents the elevation of the houses whose ground-plans are given in fig. 763.

Composite Cottages.

It will be useful to give a sketch illustrative of what has been termed composite cottages—that is, two-storeyed cottages, but of which the upper and

lower storeys form independent houses with separate entrances, the upper house being generally entered from the back.

In fig. 765 we give sketch of plan of house over that given in fig. 734: *a a* outside stairs; *b* porch, giving entrance to kitchen *c c*—this room corresponding to the apartment marked *f f* in fig. 734. The scullery *d* is entered from kitchen—*d* corresponding to the apartment *h* in fig. 734; the closet *f*, fig. 765, to porch *a* in fig. 734; *e e* living-room corresponding to same apartment *c c* in fig. 734; bed-closet *g g* to that marked *g* in fig. 734.

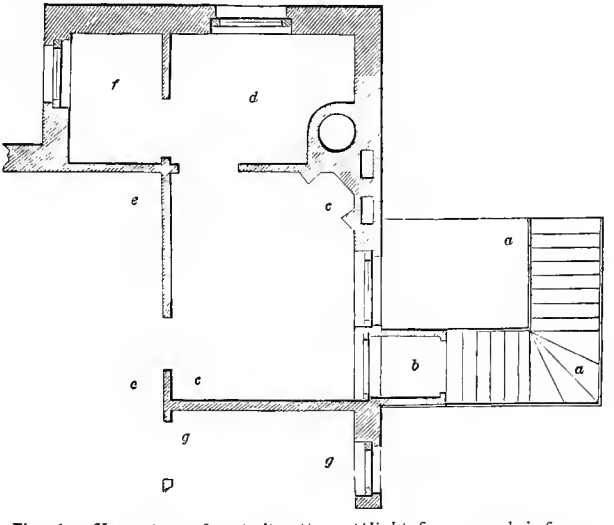


Fig. 765.—*Upper storey of composite cottage applied to* fig. 734—scale in fig. 734.

Outhouses of Cottages.

Although, in some of the examples of cottage arrangement which we have given, we have shown the privy or water-closet connected with the house, we would recommend the space to be used in some other way, as a closet for coals, pantry, &c. This will necessitate having the privy apart from the house, an arrangement which is in every way better. The separate structure should be placed in the garden at a considerable distance from the house, and should also comprise a place for coals and a pig-sty.

In many cases vegetable-gardens are now provided for married servants along with comfortable cottages.

BOTHIES.

A bothy is a structure in which a single man lives without the comforts of a resident housekeeper. In not a few cases the men cook the whole or part of their own food, but in all instances the cooking, cleaning, and bed-making should be done by a woman.

Improved bothies have separate compartments for cooking and for sleeping. The Rev. Harry Stuart, Oathlaw, Forfarshire, in an interesting pamphlet on the housing of labourers, recommended that to avoid the evils of the bothy as generally arranged, every bothy "ought to have a cooking and a sleeping apartment; the one furnished with a strong table and chairs with high backs, well bolted and stayed with iron rods, and the other with small iron bedsteads—*one for each man*—both these apartments of healthful dimensions and construction. The sleeping apartment floored with wood, well lathed on the walls, quite free of damp, yet well ventilated with ventilating flues."

Plans of Bothies.—In the "Third Annual Report of the Scottish Association for Improving the Dwellings and Domestic Condition of Agricultural Labourers," Mr Stuart illustrates and

describes an improved bothy, of which the ground-plan is given in fig. 766, and upper floor plan in fig. 767, where *a a* are the beds.

The dimensions of the whole structure are 22 feet by 16; the side-walls being 14 feet in height, measured from the sole of the outer door. The thickness of the walls is 20 inches, but those of the lower storey are lined with hollow tiles. A fire-brick sink is placed in the lobby *a*,

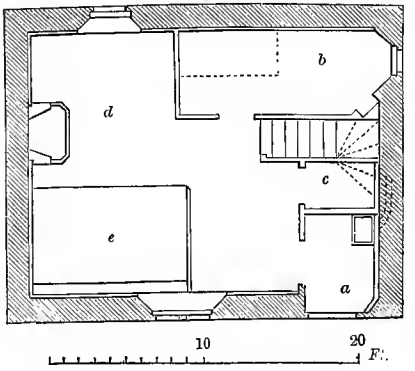


Fig. 766.—*Ground-plan of a two-storeyed bothy.*

fig. 766—a foul-air flue being carried up from this into the chimney or "vent" of the wash-closet *b*. This has a fireplace in it, so that it can be used as a spare room when any of the men are sick. The dimensions of this apartment are 12 feet

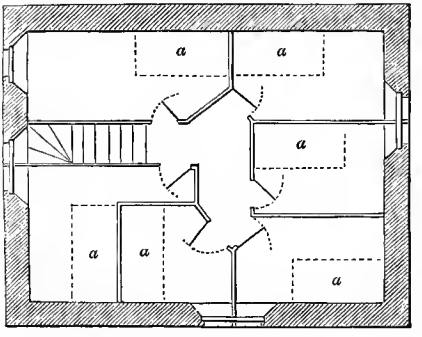


Fig. 767.—*Chamber-floor of a two-storeyed bothy*—scale in fig. 766.

by 5. Under the stairs *c* space is obtained for coals. In the kitchen *d* there is space for a resting bed *e*, the side of this bed next the door being finished and protected from its draught by a low wooden screen rising about 2 feet above the surface of the bed.

In fig. 768 we give a plan of bothy for two men, designed also by Mr Stuart: *a* kitchen, 9 feet 6 inches by 9 feet 4

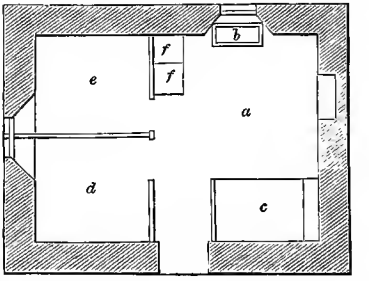


Fig. 768.—*Ground-plan of a single-storeyed bothy.*

inches, with sink *b*; resting bed *c*; *d* and *e* bed-closets, 6 feet 6 inches by 7 feet; *f f* meal-bins in the kitchen.

Evils of the Bothy System.

There has from time to time been much discussion as to the evils of the bothy system.

In some districts the bothy system cannot, under present circumstances, be got rid of, but it behoves the parties having interest in these localities to see that the bothies are improved so far as to secure comfort to their occupants. The advantages obtained in healthier workmen would amply repay the cost incurred in this way.

Origin of the Bothy System.—No difficulty ever occurred in accommodating married servants on a farm, for they must have their cottage and garden; but the best manner of lodging unmarried men has been a difficult question in many parts of the country. There are just three modes of doing it. One is to lodge them in the farmhouse; another is to provide a house for them to live in together; and the third is to lodge them in the houses of married men.

Boarding in the Kitchen.—In primitive times the farm lads used to take their meals in the farmer's kitchen, at the table of which the farmer and his wife presided. Under this arrangement they were well fed, and passed their time happily and under good influence. But there were drawbacks to it nevertheless. In wet weather the lads could not easily

have their clothes dried at the kitchen fire, and at night they had to go to a loft in the work-horse stable to sleep. At length, as the progress of refinement advanced, when the farmer preferred his own snug parlour in the company of his family to the kitchen and its inmates, such an arrangement could not be continued. Left to themselves thus in the kitchen in the evening, all the servants did not conduct themselves with propriety, so that the farmer was glad to purge his house of its unruly inmates. He provided a house for the young men to live in together, near the steading.

The Bothy. — This house was called the *bothy*. The change was an agreeable one to both parties: to the farmer, inasmuch as it restored order and quietness to his house; and to the men, because they were freed from the surveillance of the farmer's wife; and their bed in a bothy was more comfortable than the one in the stable. But, like most cases of compromise, the bothy system has not worked advantageously for either party. The farmer finds idle company congregating in the bothy in the evenings, given to drinking, card-playing, and other evil work.

Remedy.—The remedy for the bothy system is obvious: Let cottages be built on every farm where the bothy system exists. They will soon be crowded by the bothy men, anxious to marry and settle in life, or as inmates with their relations. The change from the confused crowd of a bothy to the comfort of one's own house will soon work a marked change for the better in the character of the young men. They will then have no desire to change their service. There will then be no loss of time and work every half-year; no hiring-market will then be frequented for a bad purpose, and the outcry against them, and the bothy system itself, will cease for ever. This is no inferential result, but one established from our own experience.

IRON BUILDINGS.

It is not intended that we should in this work enter into the more technical part of the construction of farm buildings. Our object has been mainly to assist landowners and tenants in the selection of suitable designs for such buildings as they may require.

We therefore abstain from discussing and describing the merits and characteristics of the materials used in the construction of farm buildings. One point, however, deserves notice, and that is the greatly increased and steadily growing extent to which iron is being employed

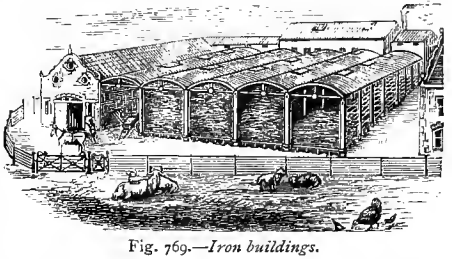


Fig. 769.—*Iron buildings.*

in the formation of these buildings. Corrugated iron is now very extensively used in covering cattle-courts, hay-sheds, cart-sheds, and other buildings on the farm; and in many cases the entire building is constructed of iron. Fig. 769 illustrates a homestead constructed of iron by F. Morton & Co. This is a step in the right direction, for iron is both cheap and durable.

OUTLAY ON BUILDINGS.

For the tabulated statement of the estimated expense of buildings on farms of various sizes on p. 378 we are indebted to the commissioner on an extensive landed property in Scotland. The estimated cost of farm buildings is exclusive of local carriage of materials, usually performed by the tenants. Rent is taken as the basis instead of acreage, as the former is a safer indication of the stocking the farm will carry.

SPECIFICATIONS.

The value of the plans we have given and described will be all the greater if we introduce one or two "sample" *Specifications.*

Rent of Farm.	Description.	Expense of				Total (for buildings separately).	Total (for all buildings).
		Mason-Work.	Carpenter-Work.	Slater-Work.	Plaster-Work.		
£40	Dwelling-house	£50	£50	£25	£15	£140	
	Offices . . .	80	55	50	...	185	
							£325
80	Dwelling-house .	70	70	30	20	190	
	Offices . . .	130	100	80	...	310	
							500
120	Dwelling-house	80	90	30	20	220	
	Offices . .	165	125	90	...	380	
							600
160	Dwelling-house . .	120	140	35	30	325	
	Offices . . .	210	160	105	...	475	
							800
200	Dwelling-house .	150	170	35	45	400	
	Offices	250	220	130	...	600	
							1000
240	Dwelling-house .	155	175	35	45	410	
	Offices	310	260	170	...	740	
							1150
300	Dwelling-house .	170	200	35	45	450	
	Offices	350	270	180	...	800	
							1250
400	Dwelling-house .	170	200	35	45	450	
	Offices	450	300	200	...	950	
							1400
500	Dwelling-house .	200	215	35	50	500	
	Offices	500	350	250	...	1100	
							1600

SPECIFICATION FOR A STEADING FOR A FARM OF 500 ACRES.

The following specifications refer particularly to the homestead illustrated in figs. 681-89, p. 328, from plans prepared specially for this work by Mr Gilbert Murray, Elvaston Castle, Derby.

Specifications of various works required in the erection and completion of a complete farm homestead at , in the county of , for and in accordance with certain drawings prepared, and details to be hereafter supplied, to which drawings and details this specification refers.

Conditions.

The contractor shall properly execute and complete the whole of the various works described, specified, or required by the drawings, details, and this specification, together with and including all such works as the architect shall consider to be fairly included in the same, in the best and most workmanlike manner, and with the best materials, and to the entire satisfaction of the architect, providing all materials, labour, and carriage, &c., of all descriptions necessary for the proper and perfect completion of the whole of the above works.

The contractor shall provide at his own cost all tools, scaffolding, implements, &c., necessary for the completion of the works.

The whole of these works shall be completed and finished within nine calendar months from the date of signing the contract, or the contractor shall pay a penalty of five pounds per week for each week the works shall remain unfinished after that date.

The payments on account shall be made in four equal instalments—viz., the first when the walls are up to level of eaves; second, when the roofs are covered and completed; third, when the works are completed; and fourth, within three months after final and satisfactory completion of the works.

Should any unsound or inferior materials be brought on the premises, or any work be improperly executed, they shall be immediately removed or amended, as the case may require.

In case the contractor shall become insolvent, or from any cause whatever shall not proceed with the work satisfactorily, as in the opinion of the architect may be necessary to ensure their timely and proper completion, then it shall be

lawful for the proprietor to employ other workmen as requisite, and any extra expense that may be incurred shall be defrayed by the contractor, and be considered as ascertained damages, and be deducted from any money due or to become due to the contractor on account of these works.

In case any dispute shall arise as to the meaning of the specification or the drawings, or with regard to any alterations, additions, or omissions, the decision of the architect shall be final and binding on all parties.

The contractor shall be responsible for any damage of any description that may be caused in consequence of these works.

The contractor shall pay all fees, and serve all notices required by the local authorities that may be necessary, without any charge to the proprietor for so doing.

The contractor shall keep the buildings herein referred to in a thorough state of repair until three months after their final completion.

Specification.

Excavator, &c.—Excavate the ground over whole area of site to a depth of 6 inches, and further excavate as shown and required for concrete foundations, walls, cross-feet, &c. The whole of the excavations shall be level at bottom, and be well rammed before the concrete is thrown in; also fill in and ram the ground round the walls below ground-level, and distribute the earth round the site, and level same as directed.

Drains.—*Note.* The rain-water drains are indicated on plan by blue colour, and the soil drains by red colour; each are to be laid separately, the rain-water to be conveyed to a tank, and the soil to some convenient site of land.

The whole of the drain-pipes are to be of the best quality and description of cylindrical glazed socket-joint stoneware pipes, having all necessary bends and junctions, and laid with proper falls, and jointed in prepared clay.

Excavate for, provide, and lay the drains in the positions shown and as figured on plan; fill in and well ram the ground after the pipes are laid.

Cesspools.—Excavate for and build the large cesspools where shown on plan to both rain and soil drains in 9-inch brickwork in mortar of the required depth to suit the drains at the different points: each cesspool shall be 2 feet 6 inches wide and 3 feet long, rendered inside with cement ½-inch thick, with properly formed concrete bottom, covered on top with a 3-inch York or other approved stone flag, with iron ring in centre.

Gullies.—Form small gullies in yards, &c., where shown, for surface drainage, composed of 9-inch brickwork, in mortar, 1 foot 6 inches square and 2 feet deep, rendered, &c., inside as large cesspools, and provide and fix to same stone dished and perforated covers 4 inches thick, with extra-strong 9-inch cast-iron grates let into same.

Provide and fix to each division of the covered cow-shed, calves'-shed, feeding-boxes, and stables, approved trapped earthenware gully, extra-strong 9-inch cast-iron grate fitted to same.

Water-tank.—Excavate for and form the rain-water tank, where shown on plan, 12 feet long, 5 feet wide, and 5 feet deep, below the inlet drains and the springing of arch, the side and end walls to be built 14 inches in thickness, in mortar, and shall have proper footing courses resting on a bed of concrete 2 feet thick, domed over on top with an arch to rise 9 inches in height, and to be formed of two half-brick rings in mortar. Render the tank on sides and bottom in Portland cement ½-inch in thickness.

Gravel Floors.—Form gravel floors to all open yards, cart and implement sheds, on a 6-inch foundation of approved hard and dry material, such as broken stones, bricks, slag, &c., and lay on top of same a 6-inch bed of good and approved gravel, all carefully laid to proper falls, the lower and top beds being each well rammed as the spreading proceeds.

Concrete to Foundations to be composed of one part hydraulic lime and one part sand, and four parts of stone, brick, or slag—or one part lime and five parts gravel—all to be broken to pass a 2-inch ring, and to be well and thoroughly mixed. Form concrete foundations to all walls, cross-feet, tank, &c., as shown on drawing.

Well.—Form a circular well 8 yards deep, 3 feet 6 inches clear internal diameter, steened with proper well bricks,

and covered over on top with a 5-inch York stone landing, with hole formed in same.

Lime.—Approved hydraulic lime shall be used in all mortar and concrete below ground-line, and ordinary local lime of an approved description shall be used for all other works.

Mortar.—The mortar shall be composed of approved lime as aforesaid, and clean sharp sand, one part of unslaked lime to two equal parts of sand well and properly mixed. No mortar which has become perished shall be used.

Bricks, &c.—The brickwork shall be executed with good and approved quality and description of common local bricks; the external facings shall be executed with carefully selected and picked common bricks, neatly pointed in mortar as the work proceeds. The bond shall be Old English. No four courses of bricks shall rise more than 1 inch in addition to the height of the bricks set dry. All brickwork shall be executed plumb and true, and in mortar as aforesaid.

Bed and set all stone and woodwork and point to same; neatly point the inside walls as the work proceeds.

Build the whole of the brick walls, as shown on the drawings, with proper footing courses, forming all openings, piers, &c., as required for the proper completion of the works.

Turn common brick arches over all door and window openings as shown.

Window-sills.—Form blue brick window-sills in cement to all window-openings as in fig. 770.

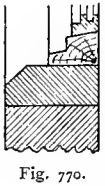


Fig. 770.

Bull-nosed Angles.—Put bull-nosed angles to all inside piers and angles of doorways.

Kerbs to stop Concrete Flooring.—Provide and fix blue brick on edge kerbs to stop concrete floors in all cases, the kerbs to be well bedded in concrete, and bedded and jointed in cement. Also form thresholds to all doors in a similar manner.

Salient Courses.—Form projecting courses to gables, &c., as shown, and details hereafter.

Plinth and Weathering to Piers.—Form plinths to gate-piers and cap same with two courses of pressed blue splayed plinth bricks. Also form weatherings to all external piers in walls in a similar manner.

Coping to Yard-wall.—Form coping to all yard-walls where shown with blue brick coping (fig. 771), and finish same against gate-piers where required in yards to cow and calves' sheds with stone coping 18 inches long, 12 inches wide, worked to mitre with blue brick coping.

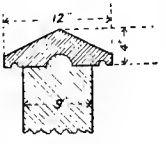


Fig. 771.

Caps to Gate-piers.—Provide and fix to top of piers to each of the gateways to main yards a tooled, weathered, and throated approved stone cap, 2 feet 3 inches by 2 feet 3 inches by 12 inches deep.

Hook-stones.—Provide and fix to each of the piers to two gateways to main yards approved stone hook-stones, No. 2 to each pier, each 1 foot 6 inches by 1 foot 6 inches by 9 inches, tooled, rebated, and sunk for and provided with strong wrought-iron hooks, with 1½-inch pins 3 inches high, properly wrought on same. Also provide and fix to all other gateways in brick walls requiring same No. 2 hook-stones in each pair, 1 foot 6 inches by 1 foot 2 inches by 6 inches, tooled, rebated, &c., as above. Also build in other doorways requiring same, No. 2 hook-stones in one pier, and No. 1 catch-stone in the other pier.

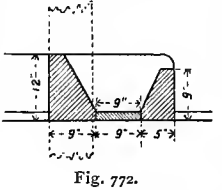


Fig. 772.

Mangers.—Form mangers to feeding-boxes and cow and calf sheds in main buildings where shown, of purposely made and approved blue bricks (fig. 772), the ends against each division being formed with solid blue brickwork, having the division posts built in same, see fig. 773. The whole shall be bedded, jointed, and built in Portland cement, and the manger bricks set 1 inch below floor-level.

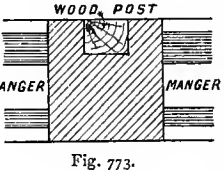


Fig. 773.

Air-grates, &c. — Provide and fix where directed No. 50 cast-iron air-grates, 9 inches by 6 inches, and properly form air-holes to same. Also form No. 25 ventilation openings in walls as will be directed.

Generally.—Run cement filleting to roof where gables abut against wall, and any other place requiring same.

Execute any and all incidental brickwork and bricklayer's work necessary for the proper completion of the whole of the works.

Damp Course.—Form damp course over whole area of all walls with properly prepared asphalt, ½-inch in thickness, laid on hot and covered with sand.

Concrete Floors. — Form concrete floors to covered feeding-boxes, cow-sheds, calves'-shed, passages, mixing-room, engine, cake and root houses, stables, loose-box, harness-room, and corn-barn, with Portland cement concrete, as hereafter specified, and a 6-inch bed of broken bricks or stones, and a 2-inch bed of fine concrete, composed of one part of Portland cement and five parts of granite chippings, the lower bed to be carefully laid and thoroughly well rammed, each piece of brick or stone being broken so as to pass a 2-inch ring, and the upper surface to be laid in the best possible manner, care being taken to fill up all the cavities in the lower bed, the whole being floated over with a finishing surface 1½ inch in thickness, and composed as above, but 1½ of chippings to 1 of cement, and left a perfectly even surface, laid with such falls as shall be directed.

Carpenter and Joiner.

The whole of the timber used in these works shall be of the best description of seconds Memel, free from sap, shakes, large, loose, or dead knots, and all defects. The whole shall be sawn square on all sides, and have the outside slabs taken off. All timbers shall hold their required scantlings throughout. All deals and battens shall be best selected red-wood. Any of the long timbers to roofs may be of pitch pine, of good and approved quality.

Main Posts.—Provide and fix No. 15, 11 inches by 11, main posts to support roofs where shown. Each post shall be carefully selected, and go into the ground 5 feet; and have 9 inches by 4 cross-feet, and No. 4, 6 inches by 6, struts secured to posts and cross-feet, with ¾-inch diameter wrought-iron bolts passing through posts, and provided with proper heads, nuts, and large washers. The cross-feet shall be secured to main posts with a 1-inch diameter bolt, 2 feet 6 inches long, let up the centre of the post, and secured with a nut let into side of post. Each cross-foot shall rest on a bed of concrete 18 inches wide and 18 inches deep, and of the necessary lengths.

Roof 20-feet Spans.—Provide and fix to each of the 20-feet spans of roofing over covered cow-sheds and covered calf-sheds No. 6 roof-trusses, one being placed over each main post, and secured to same. Tie-beams, 9 inches by 5; principal rafters, 7 inches by 5; struts and foot-pieces, 5 inches by 4; purlins, ridge, and plate next open side, 11 inches by 3; wall-plates, 4½ inches by 3; oak pads, 9 inches by 5, 3 feet long, under ends of principals resting on walls. Wrought-iron king-rod 1 inch diameter, with proper head and ½-inch washer 5 inches square at bottom, and proper nut and washer at top. Provide and fix to each king-head an iron casting as detail, weighing 56 lb. each. Bolt the feet of principals at each end to tie-beams with a ⅞-inch wrought-iron bolt passing through both timbers, and having proper heads, nuts, and washers. Secure the ends of each tie-beam to each post with a 2½-inch by ½-inch wrought-iron looped and twisted strap, passed over end of beam and extending down posts 18 inches, secured to same with one ⅝-inch bolt passing through post and strap and one 6-inch coach-screw, and secured to tie-beam with No. 2 5-inch screws.

Put to each bearing of purlins on principals a 12-inch by 7-inch by 4-inch block, well spiked to principal rafters.

Roofs 24-feet Spans.—Provide and fix to each of the 24-feet spans of roofing over cow-shed and one of the covered feeding-boxes No. 6 roof-trusses, one being placed over each main post and secured to same. Tie-beams, 11 inches by 5; principals, 8 inches by 5; struts and foot-pieces, 5 inches by 4; purlins, ridge, and plate next open side, 11 inches

by 3—and in all other respects similar to the 20-feet spans herein last specified.

Roofs 44-feet Spans.—Provide and fix to the 44-feet span of roofing over the two central covered feeding-boxes No. 3 roof-trusses, one being placed over each main post and secured to same. Tie-beams, 13 inches by 6; principals, 9 inches by 6; collars, 12 inches by 6; queens, 12 inches by 6; struts and plate on tie, 6 inches by 6; jack-rafters and king, 7 inches by 5; purlins, ridge, and plate next open sides, 11 inches by 3. Put 12-inch by 7-inch by 4-inch blocks to each purlin. Provide and fix, to secure the principals to tie, and head of principals to straining-beams and queens, and also foot of queens to tie, wrought-iron straps 3 inches wide and ½-inch thick, secured with gibs and cotters at feet of principal rafters; No. 3 ¾-inch bolts to queen-heads, and No. 1 similar bolt to foot of queen. Secure each end of tie-beam of each truss to main posts with a 3-inch by ½-inch wrought-iron looped and twisted strap passed over ends of beams, and extending down posts 2 feet, and secured to same with No. 2 ⅞-inch bolts passing through post and straps and secured to tie-beam with No. 2 6-inch coach-screws. Put block 1 foot 6 inches by 6 inches by 4 inches against sides of queens, well and securely spiked to same.

Roofs 37-feet Spans.—Provide and fix to the 37-feet span of roofing over fodder-mixing room No. 3 roof-trusses, resting on the walls as shown. Tie-beams, 12 inches by 4; principals, 8 inches by 4; collars, 11 inches by 4; queens, 11 inches by 4; struts and plates on tie-beams, 5 inches by 4; jack-rafters and kings, 6 inches by 4; purlins and ridge, 9 inches by 3; wall-plates, 4½ inches by 3; and pads under ends of principals, 9 inches by 3, 3 feet long. Secure the feet of principals to tie-beams with 2½-inch by ⅜-inch wrought-iron straps; and similar straps to head and foot of queens, secured with gibs and cotters and ¾-inch bolts in a similar manner as specified to the 44-feet span-trusses. Put block against sides of queens under straining-beams 1 foot 6 inches by 6 inches by 4 inches.

The roofs of root-house, portable engine-house, and cake and meal store shall be formed by extending the purlins, ridge, and wall-plates of the last specified roof over same from wall to wall.

Roof 24-feet Span.—Construct the roof over harness and food rooms in small block of buildings with No. 3 roof-trusses. Tie-beams, 9 inches by 4; principals, 7 inches by 4; kings, 9 inches by 4; struts, 4 inches by 4; purlins, 7 inches by 4; ridge, 7 inches by 2; wall-plates, 4½ inches by 3; blocks to purlins, 9 inches by 6 inches by 4 inches; and pads under ends of principals 9 inches by 3, 3 feet long. The feet of principals to be secured to tie-beams with ¾-inch diameter wrought-iron bolts, and the head of king and principal to be secured together with 2½-inch by ⅜-inch wrought-iron straps on each side, bolted together with ⅝-inch bolts, and foot of kings to have 2½-inch by ⅜-inch straps and ¾-inch bolts.

Roof 20-feet Spans.—Construct the roofs over cart-shed with No. 4 roof-trusses, roof over corn-barn with No. 2 trusses, roof over stables with No. 3 roof-trusses, and roof over implement-shed with No. 1 truss, all as follows: Tie-beams, 9 inches by 4; principals, 8 inches by 4; kings, 8 inches by 4; struts, 5 inches by 4; purlins, 7 inches by 4; ridge, 7 inches by 2; wall-plate, 4½ inches by 3; blocks to purlins, 9 inches by 6 inches by 4 inches; the feet of principals to be secured to ties with ¾-inch bolts, and the heads of kings to principals with 2½-inch by ⅜-inch straps on each side, secured together with ⅝-inch bolts. The principals over cart-shed, which rest on posts, to be secured to same with 2½-inch by ½-inch looped straps, and secured in a similar manner to those hereinbefore specified. Put to foot of kings 2½-inch by ⅜-inch straps and ¾-inch bolts.

The whole of the hereinbefore specified roof-trusses shall be mortised, tenoned, birdsmouthed, framed, and finished in a thoroughly workmanlike manner.

Ventilators.—Construct No. 3 ventilators on roof over cow-shed, and No. 3 similar ventilators over stables 3 feet 3 inches square inside, each having No. 4 angle-posts, heads, and sills, 3 inches by 3, covered externally with 1¼-inch wrought, rebated, and v-jointed horizontal boarding; hip-rafters and intermediate rafters

3 inches by 2½, the rafters to overhang the heads 9 inches all round, and to have 9-inch by 1¼-inch wrought and beaded fascia fixed to same; the external boarding to be finished at top level with lower edge of fascia, the space above being left for ventilation. Fix to each of the said ventilators a 1-inch wrought ledged door, hung to open on a centre, and fitted with regulating cords.

Roof Boarding.—Cover the whole of the hereinbefore specified roofs with ¾-inch approved spruce boarding, laid from eaves to ridge, properly nailed at each bearing on each purlin with No. 2 2-inch strong cut-nails. The boarding shall be laid so as to have a close joint. Any joints opening to an extent of $\frac{1}{16}$ of an inch shall be taken up and relaid at the cost of the contractor.

Loft Floor.—Construct the loft floor over harness-room with a 12-inch by 9-inch wood beam, running through the centre of room and resting on wall by stables at one end, and wall of barn at other end, supported by No. 2 9-inch by 9-inch posts, with cross-feet, &c., as to other posts. Floor joists, 9 inches by 3, placed 2 feet apart, and covered with a 1½-inch rough deal floor, closely jointed, secured with No. 2 3-inch cut-nails at each bearing on every joist. Form step-ladder up to same, strings 9 inches by 2½, treads 7 inches by 2, with 3-inch by 3-inch handrail on one side, supported by 4-inch by 3-inch uprights about 4 feet apart. Form proper trap-door at top of same, with tee-hinges, &c., complete.

Entrance-gates.—Provide and fix to the two main entrances to yards 2½-inch wrought, rebated, and chamfered square framed gates, hung in halves, filled in with 1¼-inch wrought, rebated, and chamfered boarding, fixed vertically, the top of gates to be finished with a 3½-inch by 4-inch wrought, rebated, and weathered capping. Each gate shall be hung with 2½-inch by $\frac{7}{16}$-inch wrought-iron bands, the top band on one side of each gate extending its whole width, and on other side to a length of 1 foot 6 inches. The bottom bands shall extend on both sides of each gate 2 feet, and have proper shoulders, eyes, &c., neatly formed, and be bolted to gates at every 9 inches with $\frac{7}{16}$-inch wrought-iron bolts. Each gate shall have a strong wrought-iron bolt fixed vertically for securing into stone, let into ground, also a strong rim latch and approved strap with eyes and staples, with padlocks complete.

Provide and fix to each of the large gateway openings, where shown on drawings, 2½-inch wrought, rebated, chamfered, and square-framed gates, filled in with 1¼-inch wrought, rebated, and chamfered vertical boarding, each gate, where shown, to run and have 6-inch diameter wheels, secured by wrought-iron straps to top of gates, and run on 3-inch by ¾-inch wrought-iron rails carried by 3-inch by ⅝-inch wrought-iron stays, built into the wall at distances of about 3 feet apart. Each gate shall have proper stop, and be provided with 3-inch by ⅜-inch wrought-iron knuckle-jointed strap, with eyes formed in same for securing to staple, built into wall, and be provided with approved padlock and key.

Provide and fix to all stable doorways 2½-inch wrought, rebated, and chamfered doors hung in two heights, panels filled in with 1¼-inch wrought, rebated, and chamfered boarding, each door to have proper 2½-inch by ⅜-inch wrought-iron bands for hanging to hooks before specified; the top outside half of each band to each door shall run full width of door, and the inside half and both sides of the bottom band shall be 15 inches long, all well and properly secured with bolts. Each top half of each door shall be supplied with an approved thumb-latch and stock-lock, and one bottom half of each door shall have a strong 9-inch barrel-bolt fixed on inside.

Provide and fix to all other small doorways ledged doors of the sizes shown, covered with 1¼-inch wrought, rebated, and chamfered boarding, hung with proper bands to hooks built into walls. Each door to have an approved latch and strong 9-inch barrel-bolt.

Windows.—Fit up all window-openings with 1¾-inch deal casements, properly hung with strong butt-hinges to 4½-inch by 3-inch wrought, rebated, and chamfered deal frames, with oak sunk sills, and provided with strong wrought-iron casement-stays and turnbuckles, and to details to be hereafter supplied.

Stable Mangers.—Provide and fix to cart-horse stables and loose-box wrought deal mangers, as details, with 1½-inch

fronts, bottoms, and backs, and 3-inch by 3-inch oak wrought and grooved and rounded capping on front edge, with a 3-inch strong wrought-iron ring and staple fixed in centre of its length. Put a 4-inch by 3-inch bearer tenoned into same, and built into wall at other end.

Stall Divisions.—Construct the stall divisions with 6-inch by 6-inch heel-posts, standing 6 feet 6 inches out of ground and 4 feet below, with clump ends, and 5-inch by 4-inch head-posts 6 feet 6 inches above ground, securely bolted through walls with No. 2 ⅝-inch bolts to each post. Each post shall be grooved for boarding, and chamfered on outer edges, and neatly wrought and weathered on top, and the divisions formed with 1½-inch wrought, both sides grooved, and tongued boarding, fitted into grooves on head and heel posts, all as details to be given.

Posts and Fencing to Yards, &c.—Provide and fix where shown on drawings the fencing between yards, and at heads of mangers, 4½-inch by 4½-inch wrought posts, standing 4 feet 9 inches above ground and 3 feet below ground, with clump ends, each post being chamfered at angles, neatly wrought and weathered on top, and to have No. 4 holes bored through same. Provide and fix in connection with same No. 4 tiers of extra strong iron gas-piping, the top pipe being 1¼-inch diameter, the second 1-inch diameter, and the two lower pipes ¾-inch diameter. Where these pipes run into a main post supporting roofs, they shall have cheek-pieces 4 inches by 2 spiked to same and bored to receive the ends of the pipes.

Wrought-iron Gates.—Provide and fix No. 32 pairs of wrought-iron gates of the size shown, and to details to be given hereafter, with hanging-posts 1¾ inch by ⅝, falling-posts 1¾ inch by ½, one of the latter to each pair of gates shall be thus, ⊔, to form stop for other half of gate, struts 1¾ inch by ½, top and bottom bars 1¾ inch by ½, and two intermediate 1¾ inch by $\frac{7}{16}$, the whole being properly riveted up and put together in the neatest and most workmanlike manner, and hung by strong eyes riveted on to heel-posts to ⅝-inch wrought hooks properly shouldered and formed, the top to pass through post and have nut and washer, the bottom hook to be driven into posts 3½ inches. The L-shaped falling-post to each pair of gates shall have a strong bolt riveted to same at bottom, and cast-iron socket let into a stone in ground for securing same, and each pair of gates shall be provided with a strong wrought-iron loop or ring riveted to one of the falling-posts for looping over the other.

Water-troughs.—Provide and fix No. 12 approved strong wrought galvanised iron water-troughs in yards where shown, 4 feet 6 inches long, 1 foot 9 inches wide, and 1 foot 6 inches deep, and to be 2 inches less in size at bottom, to give the sides and ends a slope, each tank having proper hole with ferrule, plug, and chain complete.

Felt on Roofs.—Cover the whole of the roofs with thick roofing felt of approved quality, and equal to sample, laid longitudinal way of roof, each joint having a 2-inch lap and nailed with strong flat-headed tin tacks, at distances apart of 3 inches. The bottom edge next eaves shall be turned down over edge of boarding and nailed the same as at joints. The ridge shall be covered with a capping of the same material 12 inches wide, and nailed in a similar manner. The valleys shall also be laid in a similar manner.

The whole of the aforesaid felting shall be well and thoroughly gas-tarred all over one coat, and afterwards gas-tarred and sanded two coats, and shall be left at the completion of the works free from all defects, sound and watertight.

Ironfounder.

Eaves Gutters.—Provide and fix to all eaves 4½-inch strong half-round eaves gutter, with all necessary stopped ends, outlets, bends, and nozzles, well and securely fixed with proper wrought-iron gutter-stays, the joints being caulked with red-lead.

Down-pipes.—Provide and fix from eaves to drains (where shown on plan) 3½-inch clear bore down-piping, with all necessary swan necks, and securely fixed to the walls.

Provide all the wrought and cast iron-work to roofs, sliding-gates, doors, &c., as specified in the carpenter's work and elsewhere: the whole shall be forged or

cast and finished in the strongest, best, and most workmanlike manner.

Glazier, Painter, Limewhite, &c.

Glazing. — Glaze the whole of the windows with ⅛-inch rough rolled glass, properly puttied and back-puttied, and left free from all defects at the completion of the works.

Gas-tar and Sand.—The whole of the posts and cross-feet below ground-level shall be gas-tarred two coats.

Carbolinium.—The whole of the posts above ground and other exposed portions of wood shall be covered with two coats with Carbolinium Avenarius.

Painter. — The whole of the wood gates and doors shall be painted three coats with good lead and oil colour, of an approved colour.

The whole of the eaves, gutters, down-piping, iron gates, iron fencing, and iron-work, &c., shall be painted two coats with similar paint.

Limewhite. — Limewhite two coats the whole of the inside wall of buildings, also the underside of boarding to all roof and all roof timbers.

Allow in amount of tender the sum of for extra works; any portions of same not required shall be deducted from the amount to be paid to the contractor at the completion of the works.

SPECIFICATION FOR MODERN STONE STEADING.

The following is an abstract of the specifications for the construction of the Inverness-shire steading referred to at p. 331, and illustrated in figs. 690 to 697.

General Conditions.—Each contractor to supply all materials, working tackle, and implements necessary for his department of the work; all materials to be of the best quality, and all work to be executed in a thoroughly efficient and workmanlike manner; tenant of farm to perform all cartages of materials, the rubble stones from nearest quarry, all other materials from nearest railway station. Employer may make alterations on the plans and specifications during the progress of work, the value of work caused or saved thereby to be regulated by schedule of prices to be given in by contractor. Employer or inspector to have power to reject any workmanship or materials which are defective or not in conformity with plans and specifications. Contractor to make good any damage to his work, and uphold it for twelve months from date of completion. Works to be commenced on acceptance of estimates, and to be finished on dates to be specified. Payments to be made in not more than three instalments, the two first during the progress of the works, at the rate of 75 per cent on value of work executed, and balance when work is finished. Contractors to give detailed estimates and schedules of their prices.

Mason-work.

Best rubble stones to be used for outside work.

Mortar to be composed of good fresh lime and clean sharp river or pit sand, in the proportion of 1 measure of lime and 1½ of sand, thoroughly incorporated, soured fourteen days before being used, and to be twice beaten over with a baton.

Tracks for foundations to be cut to depths shown on sections, or to such depth as will secure a good firm foundation, and all intermediate area of building to be entirely cleared of soil.

All *foundations* to be of large flat-bedded stones, going two-thirds through wall, and forming a scarcement of 4 inches on each side. Stones to be laid on their broadest and flattest beds, properly bonded, packed, bedded, and grouted with good lime mortar.

Walls to be of best quality of rubble building, and built to thickness figured on plans, with two headers in every superficial yard going at least two-thirds through walls. Stones to be laid on their broadest and flattest beds, and not to rise higher than 8 inches or less than 3 inches, and all to be bedded, packed, and grouted in good lime mortar. Surface of outside walls to be of roughly squared rubble, pointed neatly, horizontally and vertically, and drawn in with a "key." All inside walls to be neatly sneck-harled.

Dwarf walls to be built under all partitions, 14 inches thick, and finished on top to the depth of 4 inches with cement. The inside sills of all windows

and ventilators to be finished on top, to the depth of 3 inches, with cement, finished smooth, and all to slope to inside.

Dressings.—All outside corners, rybats, window-soles, lintels, mullions, scuntions, arch-stones, put-stones, pillars of cart-shed, skew-tabling, and balls on gables to be freestone, clean scabbled. Keystone of arches, along with every second stone of same, to be of length to pass through the wall, as well as inband rybats and scuntions throughout walls. Corners and scuntions to be not less than 7½ inches broad on the bed. All inside doors and openings to be built with neatly hammer-dressed scuntions from rubble quarry. Lintels, sills, and mullions to be in single lengths, the two former to have 8 inches wall-hold at each end, and the latter to be dowelled into the sills and lintels, with oak dowels and white-lead. Balls on gables to be similarly fixed.

Bases of solid masonry to be built under feeding troughs in covered courts and byres, and to be covered on top with fair-faced, chip-edged Caithness pavement, to be of size to breadth the top of troughs, and not thinner than 1⅝ inch, to be laid level and bedded in, and neatly jointed with mortar. Bases of stone and lime, 1 foot 8 inches square, to be built under metal pillars in cattle-courts where shown on plans, and coped with a block of stone 1 foot 6 inches diameter and 9 inches thick, and to be checked for bases of metal pillars. Stone corbels 1 foot 9 inches by 10 inches by 6 inches to be built into side walls of straw-barn, at 8 feet between centres, to support roofs of courts. Bases of hard stone, 12 inches cube, to be placed for heel-posts of stable travises, and to be bevelled and checked for posts, and to stand 4 inches above causeway. Stop stones for large opening doors to be similar, to be bored for bolts of gates, and to be firmly fixed in the ground.

Causeway.—All parts on plans tinted light pink, stables, implement-house, byres, and feeding-passages, to be laid with selected egg-shaped causeway-stones, in a bed of sand at least 6 inches deep, blinded with same, and well bishoped down.

Curb.—Dressed curb-stones, 1 foot deep and 3 inches thick, to be fitted in byres to form one side of urine strand, to be set in bed of sand and properly causewayed around.

Cesspools to be built of stone and lime under urine strands 1 foot 6 inches deep and 1 foot square, and to be coped on top with a stone 5 inches thick, and to have a strong malleable iron grating checked into it.

Drains from these cesspools to be of 5 inches spigot and faucet glazed fire-clay pipes, to be jointed with fine clay, and laid with a fall of 1 in 30.

Urine Cesspool to be 10 feet by 3 feet by 5 feet deep. Side walls to be 1 foot 4 inches thick, and to be built of stones and cement. Bottom to be laid with 4 inches of concrete, and it and the sides to be pointed with cement and made perfectly water-tight. Top to be covered with Caithness pavement 2½ inches thick.

Concrete.—Floors of corn-room and part of straw-barn to be laid with cement concrete. Soil and rubbish to be removed, and a layer of 6 inches of gravel or road metal laid down, and to be firmly beaten down and grouted with lime mortar. The first layer of concrete to be the depth of 4 inches, composed of five measures of small gravel or broken stones and one of best Portland cement, and to be finished to the depth of 1 inch with concrete composed of one of best cement to one of fine sharp sand. Surface to be made smooth and level. Concrete to be properly prepared on a boarding, and applied fresh.

Pavement.—All parts of ground-plan coloured blue—gig-shed, tool-house, poultry-house, feeding material store, and feeding-troughs—to be laid with fine-faced, chip-edged Caithness pavement, not thinner than 1⅝-inch thick, to be laid on properly prepared beds of small stones grouted with mortar.

Mill-wheel Arc.—Walls to be of best common rubble masonry. All the inside of arc, where it comes in contact with the water, to be of square dressed rubble stones, not less than 1 foot 6 inches long, 6 inches high, and 9 inches broad, and to be laid in and neatly jointed and pointed with cement. Openings for entry and exit for water to be formed, and to be built with scuntions and lintelled. Bottom of wheel-pit to be laid

with flag-stones, to prevent its breaking with water.

Conduit for Water to and from Wheel-pit.—Conduit to be 3 feet by 3, inside measurement. Side walls, 1 foot 6 inches of common rubble, 3 inches of side next conduit to be built with cement, foundations to be 9 inches below finished bottom. *Bottom* to be causewayed firmly, so as water may not undermine it. *Top* to be of flag-stones 3½ inches thick at least, with a wall-hold of 7 inches on each side, and closely laid and pointed on the joints with mortar.

Giblet-checks to cut for all arched openings, which are to be fitted with closing doors; and *recesses* for down water-pipes from roofs to be made. *Raggles* to be cut when necessary. Mason to uphold his work for twelve months.

Carpenter-work.

Timber to be of the best kind, free from blemishes, large or loose knots, sapwood, or shakes; to be of uniform colour, and of the sizes specified; all to be of Norwegian whitewood, except for windows, and rinds for two-thirds slating, which are to be of redwood: all wood to be sawn die square and thoroughly seasoned. *Lintels.*—Safe lintels to be 1¼-inch deep for every foot of carry, and to have 8 inches wall-hold. *Joisting.*—Joists for support of grain-lofts and sheaf-barn to be 9 inches by 2½, those for men's sleeping-place 8 inches by 2½, placed at 18 inches apart from centres, on wall-plates 6 inches by 1.

Roofing.—Rafters and ties to be 6 inches by 2½, placed 18 inches apart from centres. Rafters for dormer windows to be 5 inches by 2, diagonal rafters 7½ inches by 3½. Rafters over cattle-courts for two-thirds slating to be placed 22 inches between centres. All rafters and ties to be checked and spiked at the apex with two nails that will rivet.

Pillars.—Pillars for support of roofs of cattle-courts to be 5 inches diameter, metal ½-inch thick, with flanges at top and bottom, the top to be bolted to wooden beams over, and the bottom sunk in stone cases.

Beams.—Beams over metal pillars to be 8 inches by 9; those over stone corbels at side of walls 6 inches by 7. All to be scarfed and bolted at the joinings, and to have 9 inches wall-hold at each end. *Beams* for support of mill machinery to be 8 inches by 9.

Sarking.—All roofs, except those of cattle-courts and inside roofs of byres, to be covered with sarking deals, ¾-inch thick, close-jointed, double-nailed, and made to break band at proper intervals. Roofs of cattle-courts and inside roofs of byres to be fitted with rinds 2 inches by 1¼, to suit slates 14 inches by 10, having 3 inches of cover. Rinds to be of redwood.

Brackets to be fitted up for cast-iron gutters. *Sky-lights.*—The sky-lights to be 1 foot 4 inches by 2 feet, daylight measure, of cast-iron, with proper flange frames, 12 to open, the others fixed, and all to be glazed with glass ⅛-inch thick, each strip being in one piece. *Hanging-posts*, in lofts over implement, gig, and tool houses, and in men's sleeping-place, to be 4 inches by 2; to be nailed to rafters and joists; to be prepared for lath and plaster in men's sleeping-place, and lined from floor to sarking in lofts, with ⅝-inch thick dressed and ploughed deal lining.

Partitions.—Wooden partitions to have standards 4 inches by 2 placed 27 inches apart, and to have braces at top and bottom and intermediate, not more than 2 feet apart, firmly checked and nailed together, and to be lined with dressed and ploughed lining ¾-inch thick. Those along feeding passages to the height of 3 feet above bottom of feeding-troughs. Other wooden partitions to be lined on both sides to height of side walls, thereafter on one side to apex. *Openings* 2 feet 6 inches by 1 foot 6 inches in partitions of cattle-courts for feeding from. Passage to be fitted with doors of ¾-inch deal, with strong backings, and to be hinged from top, and to have fasteners at bottom.

Troughs and Haiks.—Crib-trees in byres and cattle-courts to be 9 inches by 3, securely fixed. Haiks to be fitted over troughs in byres and in cattle-courts where marked on plans. Upper rail, 4 inches by 3; lower, 3 inches by 3; splits, 1¼-inch square, placed 4½ inches apart, angle out.

Byre Fittings.—Travises to have head and heel posts—the former to be batted to the wall, the latter sunk 2 feet 3

inches in the ground. Planking, 1½ inch, to be raggled into posts dowelled at the joints, and to have a 2½-inch coping firmly fixed on.

Stable Fittings.—Travises to have head and heel posts, the latter to be octagon-shaped, 8 inches in diameter; to be sunk in stone bases supplied by mason; and fixed at top to runner, 8 inches by 3, fixed to under side of ties. Head-posts to be batted to walls. Posts to be raggled for planking. Planks, 1½-inch thick, are to be beaded, closely put together, and dowelled with strong iron dowels, not more than 1 foot 6 inches apart. Travises to be coped with strong hoop-iron. *Striking plates*, 1 foot 6 inches by 3 inches by ⅛ inch, of malleable iron, to be fixed firmly with screws on heel-posts. *Low hacks* to be fitted up; top and bottom rails, 5 inches square; front and bottom spars to be firmly nailed together.

Corn-boxes to be formed of 1½-inch plank, 1 foot 6 inches by 1 foot 3 inches by 1 foot 2 inches, strongly dovetailed at joints, and put together with white-lead, and to have a hoop-iron coping. *Binding-rings*, 2¾ inches diameter, to be fitted on top rail of each stall. *Iron hooks* to be fitted on heel-posts for bridles, &c. *Fittings* for hanging harness to be put up on wall behind each stall.

Stairs.—Stairs to sheaf-loft, granary, and men's sleeping-place to be fitted up as trap-stairs. Treads and stringers to be 1¾-inch plank, firmly put together, and lined on back with ¾-inch dressed and ploughed deal lining.

Flooring.—All parts on plans tinted light yellow to be laid with 1-inch thick flooring, close-jointed, dressed off, and firmly nailed down. *Skirtings* to be 6 inches high, and to be firmly fixed to walls, &c.

Doors.—Small *outside* doors to have four backings 6 inches by 1¼, lined on face with 1⅛-inch dressed, ploughed, and beaded deal. Linings not to exceed 5 inches in breadth. *Inside* doors to have linings 1⅛-inch thick, otherwise same as outside doors. *Stable* doors to be in two leaves. All doors to be hung with crooks and bands. The latter to be 1 foot 8 inches long, 1¾ inch broad, and ⅜ thick. Crooks to be made of ¾-inch iron. Door-posts, 6 inches by 3, to be batted to walls. Stops, ¾-inch, to be fitted for doors. Doors for large openings to be in two leaves; backings and one diagonal to be 5 inches broad and 1¼-inch thick, and lined on face with 1¼-inch dressed, ploughed, and beaded deal. Each leaf to be hung with crooks and bands. Bands 28 inches long, 1⅞-inch broad, and ⅜-inch thick. Crooks to be of ⅞-inch iron. Slip-bolts, 2 feet long, to be put on doors, and made to slip into iron socket at top and into stone at bottom. Bar of malleable iron, 3 feet long, 2⅜ inches broad, and ½-inch thick, and iron catches, to be bolted on each large door.

Locks, &c.—Doors to grain-lofts, corn-room, tool-house, gig-house, poultry-house, stables, and men's sleeping-place, to have 9-inch stock locks; stable doors to have concealed latches. All other doors to have 10-inch flat slip-bolts, with bowl handles on both sides.

Windows.—The windows to be made as on elevations, 2⅛ inches thick, dead framed; the upper half to have astragals, and be glazed with third crown glass; the bottom to be fitted with opening doors, having hinges, snecks, and stops. Window in men's sleeping-place to be glazed in lower part, and hung with pulleys, weights, and cords.

Louver-boarding.—Openings in stone walls for ventilation to be fitted with louver-boarding: frames of 2-inch wood batted in; louver-boards 1 inch thick, and to be hung on iron pivots, and to have iron jointed guide for opening and shutting.

Painting.—The whole outside wood and iron work, including iron pillars and sky-lights, to be painted with three coats of good oil-paint; tints to be selected. The inside of byre doors and windows to get two coats of paint.

Slater-work.

Roofs, except those of cattle-courts and inside roofs of byres, to be covered with best sizeable Ballahulish slates, put on with 12 lb. malleable-iron nails, which have been dipped in oil while red-hot. Slates to be properly dressed and close laid, having 3 inches of cover at the eaves, gradually diminishing to 2 inches at the ridge, and all to be shouldered with well-haired lime mortar. Roofs of cattle-courts and inside roofs of byres

to be two-thirds slated with best blue Port slates, 14 inches by 10, and not thinner than ⅜-inch, securely nailed to rinds with 3 inches of cover at eaves, diminishing gradually to 2 inches at ridge. *Pointing.*—The skews and raggles to be pointed with cement, and left perfectly water-tight.

Ventilators. — Double-horned ventilators will be fitted on roofs where shown on plans. *Ridges.*—The ridges to be of Arbroath stone, and to be laid in a properly prepared bed of mortar, and to be pointed with cement. The slater will leave the roofs complete and water-tight, and maintain them in that state for twelve months free of expense to the employer.

Plumber-work.

Lead.—All lead used to be 5 lb. per superficial foot, and of the best milled kind. Valley and pared lead to be 12 inches broad, aprons of sky-lights 15 inches broad and turned up at the edge. *Gutters.*—Cast-iron gutters of Macfarlane's pattern, No. 35, 19 inches by 5, tapered, to be properly fitted in between roofs, and to be jointed together with bolts and red-lead. At side of granary and straw-barn, over stone corbels, boundary-wall gutters, Macfarlane's pattern, No. 28, 16 inches by 6, will be fitted in, and to have a 6-inch lead flashing on walls, pointed with cement. The gutters to be laid so as to have a proper fall to the down-pipes. *Down-pipes.*—Down-pipes from gutters to be 4 inches diameter, of cast-iron, to be properly joined to gutters and drains, and to have a cast-iron rose grating on top, to prevent leaves or rubbish entering pipes.

Rones. — All eaves to have 5-inch cast-iron semicircular rones, and to be supported by straps 1¼ inch by ¼ at every 4 feet 6 inches apart. *Down-pipes* from rones to be 2½ inches diameter, of cast-iron, to be secured to walls by clips, and let into tile-drain.

Vane.—One weather-vane, Macfarlane's pattern, No. 57, to be securely fitted on front centre gable.

Ventilators. — Double-horned ventilators, 6 inches diameter, to be fitted on roofs of byres and stables where shown on plans.

Painting.—All rones, gutters, down-pipes, and weather-vane to be painted three coats of good oil-paint, colour to be selected.

Drains and Pipes.—Pipes to be of 5 inches diameter, fireclay, spigot and faucet, and to be jointed with clay, in tracks at least 12 inches from surface, and laid with a fall of 1 in 30.

Lath and Plaster Work.

Lath to be of the best quality of Baltic material, $\frac{3}{16}$-inch thick, and to be evenly split, and put on with cast-iron lath-nails, and giving sufficient rivet for the plaster.

Plaster.—Plaster to be composed of fresh lime, clean, sharp, fresh-water sand, and long fresh hair, mixed in proper proportions, and to be thoroughly soured, beat, and prepared twenty days before being used. The partitions and ceilings of men's sleeping-place to be lathed, and they and the stone walls to receive two coats of plaster, properly prepared, straighted, floated, hard rubbed in, finished smooth, free of blisters or any defects. The stone walls of stables, oil-cake store, gig-house, tool-house, workshop, poultry-house, grain and sheaf lofts to receive one coat of plaster, properly put on, finished smooth, and free of blisters or defects. Any holes behind skirtings to be pointed up. Window-cases and door-frames to be bedded in fine lime, and reveals to be made up with cement, and to be left water-tight. All breakages in plaster to be made good, and the whole works left complete and satisfactory.

SPECIFICATIONS OF LABOURERS' COTTAGES.

The following is an abstract of the specifications of the mason, carpenter, slater, plumber, lath and plaster works of the labourers' cottages recently erected in Morayshire, which are illustrated in figs. 575 to 578, pp. 370, 371.

General Conditions.—Each contractor will supply all materials, working tackle, and implements necessary for the due completion of his department of the works.

Cartages. — The tenant of the farm will perform all cartages from nearest railway station or a like distance.

Materials, &c. — All materials used shall be of the best quality, and all work shall be executed in an efficient and workmanlike manner, and to the satisfaction of any inspector the employer may appoint.

Payments.—The first two payments to contractors will be made during the progress of the works, at the rate of 75 per cent, and the balance paid when the work is completed and taken off contractors' hands.

Scaffolding.—Each contractor to supply centres, moulds, scaffolding, &c., necessary for own department of the works.

Mason-work.

Stones. — Stones for rubble building will be taken from Quarry, and to be of good, sound, durable material.

Mortar.—Mortar will be composed of one measure of good lime to one and a half of clean sharp river or pit sand, the lime and sand to be well mixed together first in the dry state, in order that the ingredients may be thoroughly incorporated, and to be soured fourteen days, and twice beaten over with a baton before it is used.

Excavations.—Tracks for foundations to be cut as shown on section, and the internal area of building to be cleared of soil.

Foundations. — Foundations will be laid of large flat-bedded stones, forming a scarcement of 4 inches on each side, and to be bedded, packed, and grouted in good mortar.

Walls.—Walls above foundations will be built of the best quality of common rubble, building to thicknesses shown on plan, having two headers in every superficial yard, going at least two-thirds through walls, from outside and inside alternately, all carried up plumb. The stones laid on their broadest beds, and not to rise higher than 9 inches or less than 3, and all bedded, packed, and grouted in mortar. The front and two end elevations will be of roughly squared rubble, pointed neatly, horizontally and vertically, and drawn in with a key. The back elevation to be pointed horizontally, with occasional vertical draughts. Dwarf walls will be built 14 inches thick under sleepers and partitions. Inside of all walls will be neatly sneck-harled.

Dressings. — Sills, lintels, mullion, rybats, corners, chimney-head coping, jambs of fireplaces, and coping of ash-pits to be of well-dressed freestone, clean scabbled. Rybats and corners, chimney-head, &c., will be finished with 2 inches droved margin, and the tails neatly pick-dressed. The mullion reveals of doors and windows to be tooled to match margin. Lintels, sills, and mullion will be in single lengths, the two former to have 8 inches wall-hold, and latter to be dowelled into sill and lintel.

All freestone to be set in fine lime.

Ventilation. — Four cast-iron ventilators, 6 inches square, will be fitted in freestone frames, and built into walls under floors.

Door-steps.—Door-steps will be in single blocks.

Vents.—Vents will be 12 inches diameter from living-rooms, and 10 inches diameter from bedrooms, carried up fair and smooth, and made to vent freely.

Hearths for living-rooms to be 4 feet 6 inches by 2 feet 2 inches, and bedroom 4 feet by 2, of sawn-edged Caithness pavement, to have beds of rubble building on ground-floor, and beds of clay and lime on bedroom floor, at 3 inches within line of wall, and joined to back hearth 12 inches broad.

Pavement.—Floors of lobbies, pantries, and privies, tinted blue on plans, to be laid with 1⅝-inch fair-faced Caithness pavement, to be bottomed with 6 inches of broken stones, and pavement to be bedded in and neatly jointed with lime mortar.

Causeway.—Coal-cellars will be causewayed with neat causeway-stones, in a bed of sand, blinded and bishoped down.

Sundries.—All jobbing in this department will be done by the mason, and he will cut raggles, bore holes, and do everything necessary so as to complete the work. He will uphold it twelve months.

Carpenter-work.

Timber.—Timber for the works must be of the best kind, free from blemishes, knots, sapwood, shakes, and of sizes specified. Outside doors, door-posts, projections of roofs, lintels and windows, to be of Swedish redwood. Flooring,

sarking, joists, stairs, ties, rafters, sleepers, standards, wall-straps, finishings, &c., to be whitewood.

Lintels.—Lintels to be 1¼-inch deep to the foot of carry, and to have 8 inches wall-hold at each end.

Joists, &c.—Joists, 8 inches by 2¼, and sleepers, 6 inches by 2, to be placed 16 inches apart on wall-deals, 6 inches by 1. Trimmer-joists 3 inches thick. The joists will be boxed and bridled for hearth and stair openings, and all joists to have 10 inches wall-hold at each end.

Roofing.—Rafters, 6 inches by 2½, and ties, 6 inches by 2, half checked at joints, and spiked with two spike-nails that will rivet, and placed 16 inches apart on wall-deals, 4 inches by 1¾. All bridle and trimmer rafters to be ½ inch thicker. Diagonals to be 8 inches by 2½, and intersections of roofs to be carefully formed. Ridge battens and tilting-pieces to be put on where required.

Sarking.—Sarking, ¾-inch thick, close jointed, double-nailed, and made to break band properly.

Projections.—The ends of rafters will project beyond line of wall, and the gable ends will have blocks of wood built into same and fixed to rafters, to have ogee moulding on end, and made to project beyond line of wall, and finished with a moulding, 3½ inches by 2, and facing, 1 inch thick. The slates to go over top of moulding. All roof projections will be dressed.

Deafening.—Deafening boards, ⅝-inch thick, will be put on straps, 1¼ inch by ¾, nailed to joists of bedroom floor.

Strapping.—The stone walls (with exception of coal-cellars and privies) to be strapped with straps, 1 inch by 1½, at every 14 inches apart, and nailed to dooks or bondwood at every 20 inches in height, and framed across vents.

Grounds to be fitted up for finishings.

Partitions.—Partition standards, top and bottom runners, and hanging-posts to be 4 inches by 2, all securely fitted up, the standards placed at 14 inches apart, and hanging-posts spiked to joists and rafters.

Door-posts.—Door-posts to be 6 inches by 3, and to be dressed and checked for lath and plaster, and secured in stone walls by iron bats run with lead.

Wall-presses.—Wall-press frames to be 4 inches by 1½, and lined round front and sides with ⅝-inch thick grooved and tongued lining.

Fan-light.—Front entrance doors to have transom of wood and framed fanlights.

Windows.—Windows to be framed in the ordinary manner with double sashes, sunk sills, moulded astragals, brass-faced axle pulleys, stout lifters and fasteners of brass, metal weights, patent plaited cord, &c., complete. All upper sashes will be hung. Lifters and fasteners will be selected.

Flooring.—All portions on plans tinted yellow will be laid with 1⅛-inch flooring, grooved and tongued.

Stairs.—Stairs to be common traps without risers, the treads raggled into strings, and lined on back. The handrails to be of birch, formed ovolo and polished, and balusters of cast-iron.

Shelving.—Pantries will have two and presses three tiers of inch-thick shelves, supported on framed brackets in pantries and fillets in presses.

Doors.—Doors on front entrances to be 2⅛ inches thick, in two leaves, and on privies and coal-cellars 2 inches thick, one leaf, and framed and lined on face with V-jointed, dressed, and ploughed lining. Press and pantry doors to be 1½ inch, and other inside doors 1¾ inch, framed and panelled, and plain sunk mouldings.

Ironmongery.—All doors will be hung on 6-inch D.J. edge hinges; double-leaved doors to have two slip-bolts; front doors to have 8-inch cased locks, and enamelled iron knobs; privies to have slip-bolts; presses to have press locks, value 2s. P.C.; living-room, bedroom, &c., doors will have 6-inch rim locks and brass furniture; cellars 6-inch rim locks.

Stops.—Dressed stops to be put round doors.

Skirting.—Skirting, 6 inches high, with bead on top, to be put round all apartments.

Facings.—Beaded facings, 4½ inches broad, will be put round all doors and windows.

Lining.—The ingoes, breasts, soffits, and elbows of windows on ground-floor to be lined.

Beads.—Angles to be finished with 1-inch beads.

Chimney-pieces.—Bedrooms and living-rooms will have plain chimney-pieces.

Sky-lights.—Four-hinged cast-iron sky-lights, 2 feet by 1 foot 6 inches, will be placed in roof where shown. Carpenter will fit up seats in privies with portable cover.

Painting.—Wood-work to be primed before glazing. Outside wood-work painted three coats good oil-paint—doors marone, windows white, roof projections oak. Stair balusters and sky-lights to be painted two coats.

Glazing.—All windows and fan-lights will be glazed with third crown glass, and sky-lights with clear sky-light glass, all cut to requisite sizes, and set in oil putty, and made water-tight.

Sundries.—The carpenter will perform all jobbing in his department, and leave all in a proper and workmanlike state.

Slater-work.

Slates.—The whole roofs to be covered with the best sizeable Ballahulish slates, put on with 12 lb. malleable-iron nails dipped in oil while red-hot.

Cover, &c.—The slates will have 3½ inches cover at the eaves, gradually diminishing to 2¼ inches at ridge, and all shouldered round with haired lime mortar. Nail-holes drilled 1½ inch down slates.

Sundries.—The slater will leave roofs water-tight, and maintain them in that state for twelve months free of expense to employer.

Plumber-work.

Lead.—Best milled lead to be used, and to be 5 lb. per superficial foot.

The ridges will be 14 inches broad, and secured by iron straps at every 2 feet; valleys and flashings 12 inches broad. Flashings to stand 4 inches high, and batted into raggle ¾-inch deep, which will be pointed with cement. Aprons of lead will be placed at sky-light.

Rones.—Roofs will all have 5-inch rones; supporting straps 1¼ by ¼ inch.

Down-pipes.—Cast-iron down-pipes, 2½ inches diameter, will be fitted up where shown, having lead bend at top, and connected to tile-drain.

Drains.—Drains will be of glazed fire-clay, spigot and faucet pipes, 4 inches diameter, to be not less than 12 inches from surface, and carried with proper fall to point where will be directed. Drains to be estimated for per lineal yard.

Finials.—Two finials of Macfarlane's pattern, No. 231, to be fitted on roofs where shown. The wooden blocks to be covered with lead.

Painting.—All rones, down-pipes, and finials will be painted with two coats good oil-paint.

Sundries.—The contractor will do everything necessary, so as to render his work complete and water-tight, and uphold it twelve months after completion.

Lath and Plaster Work.

Lath used to be of the best quality of Baltic material, $\frac{5}{16}$-inch thick, evenly split, and put on with cast lath-nails, leaving sufficient rivet for the plaster. Plaster to be composed of good fresh lime, clean sharp river or pit sand, and long fresh hair, mixed in proper proportions, and thoroughly soured, beat, and prepared fourteen days before being used. The bedroom floor of house will be deafened with a coat of haired plaster-lime, 2½ inches thick, laid close.

All strapped walls, partitions on both sides, ceiling, soffits, breasts, and ingoes (except where lined with wood), will be lathed and then plastered, two coats; plaster properly prepared, straighted, floated, hard rubbed in, and finished smooth, free of blisters, water-cracks, or any such defects. Walls and partitions will be lathed and plastered down to floors behind skirting.

Beads to be relieved on each side. The window-cases and door-frames will be bedded in fine lime, and reveals made up with cement, and left perfectly water-tight. All breakages will be made good by the plasterer when the works are otherwise finished, and the whole works left complete and satisfactory.

BREEDS OF FARM LIVE STOCK.

In the space available in this work it would be useless to attempt to give anything like a complete historical account of the many varieties of farm live stock which are maintained in the British Islands. Recognising that matters of practical concern rather than those of historical interest have, in the *Book of the Farm*, the first claim upon our attention, we have in the preceding volumes dealt fully with the management of the different classes of farm live stock. Here we are compelled, and that reluctantly, to content ourselves with presenting in a brief pen-and-ink sketch the characteristics of the various breeds as they now exist, prefixing to the sketch of each a few sentences setting forth the outstanding facts or most generally accepted notions as to the origin and development of the variety.

We shall take the different classes of stock in the following order—viz., Horses, Cattle, Sheep, and Swine.

HORSES.

It is of course with horses employed in farm-work that we are mainly concerned. The chief breeds of these are the Shire, Clydesdale, and Suffolk. Beyond the limits of these breeds, as marked by registration in the respective stud-books, there are a very large number of agricultural horses throughout the United Kingdom. Indeed the rank and file of British farm-horses are of mixed breeding, and represent types and degrees of merit too numerous for individual mention. It must suffice to notice briefly each of the three great breeds which are mentioned above, and upon which the British farmers have mainly to depend for the maintenance of their stock of draught-horses.

The other leading breeds of horses in the British Isles are the Thoroughbred (Racer), the Hackney, and the Cleveland Bay. Then there are the Hunter and other varieties, besides ponies of many patterns. Of these only the Hackney and Cleveland Bay call for special notice in this work.

That most useful animal the donkey is well entitled to mention amongst "horses used for agricultural purposes," for, particularly in Ireland, it performs an astonishing amount of farm-work. The mule is another most useful beast of burden, largely used in street traffic as well as in farm-work.

SHIRE HORSES.

Origin.—The Shire horses of to-day are the lineal descendants of the Old English War-horse, which ancient writers tell us excited the surprise and admiration of the Romans when they first invaded England. They may not be the only surviving descendants of that noble race of horses (which at the time of the Roman invasions are said to have been distinguished alike for strength and courage), but they are now generally regarded as the purest living representatives of that earlier type.

In an interesting brochure, entitled *A Short History, tracing the Shire Horse to the Old English Great Horse*,[1] Mr Walter Gilbey says: "Recent investigations appear to establish that what during the past few years has been spoken of as the Shire horse is the closest representative of — the purest in descent from—the oldest form of horse in the island. A thousand years ago this form was written of as 'The Great Horse'; and nearly a thousand years before that we have evidence which goes to prove that the same stamp of horse then existed in Britain, and that it was admitted by those who saw it here to be something different from—and something better of its kind than—what any of the witnesses (of that day) had seen before: and they had seen most of the horses of those times."

Name of the Breed.—For a long time prior to the advent of the nineteenth

[1] Published in 1888 by Vinton & Co., Limited, London.

century, and for many years thereafter, the breed was widely known as the Large Black Old English Horse. It is now universally recognised by the title of "Shire," derived from "the Shire counties in the heart of England," in which Arthur Young, writing near the end of the eighteenth century, stated that the Old English Horse was principally produced.

Shire Horse Society.—The desirability of taking steps to encourage the improvement of the old English breed of cart-horses was brought into public notice by a paper read by Mr Frederick Street at the Farmers' Club, London, in 1878. The result was the establishment of the Shire Horse Society, under whose fostering care the breed has been vastly improved,—made more uniform in type and character, much sounder in wind and limb, and altogether of a decidedly improved stamp in the general attributes of a draught-horse. The Shire Horse Society issue a volume of the *Shire Stud-Book* every year. The first volume, published in 1880, contains the pedigrees of 2380 stallions, many of which were foaled in the eighteenth century. The Society likewise hold a great annual Shire Horse Show in London every spring, which has done much to further the interests of the breed.

Characteristics.

Colour.—As would be inferred from the use of the title the Old English Black Horse, black was no doubt at one time the prevailing colour of the breed. A very large number are still black, but bay and brown of varying shades predominate. Many are grey, roan, or chestnut, but light colours are not, as a rule, in favour in the market.

Size.—It is undisputed that the Shire Horse is the largest of all the varieties of draught-horses which exist in this country, or indeed in any other country. About 17 hands is a common height amongst the stallions of the breed.

Form.—When the Shire Horse Society began its good work, the rank and file of the breed presented defects which materially impaired the value of the horses for hard work. Chief of these were short upright pasterns, wide hock action, unsoundness, and sluggish movement. In all these points a marked improvement has been effected. To one who, like the writer, has been regularly attending the London Shire Horse Shows, the contrast between the general characteristics of the animals exhibited at the earlier and later shows is most striking. The Society, with commendable prudence, put down its foot firmly in the matter of soundness. A stringent veterinary inspection has been insisted upon, and no animal known to have the faintest trace of hereditary unsoundness has been permitted to participate in the Society's honours. The effect has been most beneficial, and has in no small degree contributed to the advance in the selling price of Shires both for home and foreign buyers.

Conception of Form.—There has from time to time been much discussion as to what constitutes perfection in the conformation of a draught-horse. Complete agreement has not yet been arrived at, and never will. A better and more general understanding, however, now prevails on the subject; and thus we now find in the displays of draught-horses of different breeds at leading shows a much nearer approach to uniformity in the more crucial points and features than was observable in the earlier history of horse shows.

English and Scotch Notions.—It is a trite saying that in judging a horse a Scotchman begins with the feet and legs of the animal, an Englishman with its top. By this it is meant that the chief consideration with the Scotch judge is the feet and legs, and with the English the body of the horse. Of both judges there is truth in the statement, and in these habits both are mistaken. It is true, no doubt, as the Scotchman argues, that without good, sound, well-formed, well-set legs and feet to carry and propel it, the best body one could conceive would be of little value. It is equally true, as the Englishman contends, that a horse with a big well-formed body will usually fetch more money in the market than one with a small weak body. And since both these contentions are well founded, it is surely the duty of judges to have due regard to both features, and thus encourage the development of a class of horses equally meritorious in

body and limb. Happily this desideratum is now being more generally recognised than in former years, and as a result we find better legs and feet amongst the Shires, and better bodies amongst the Clydesdales, than were to be seen very generally at one time.

Pastern.—It is now universally acknowledged that a short upright pastern is an objectionable feature in a horse, whether for draught or other purposes. With such a pastern the shock to the system, in either walking, trotting, or galloping under a burden, must obviously be much greater than with the "springy" action of a moderately long sloping pastern. This point is more keenly appreciated in England now than in former times. There is still room for improvement in the pastern in the vast majority of Shire horses, yet visitors to the London shows of Shire horses have observed a marked improvement, which has been so well maintained that any defect in this respect must ere long be eradicated.

Legs.—Similar remarks would apply to the general conformation of legs and feet. The unduly wide hind action, so prevalent at one time in English draught-horses, is still too common. A bent hind leg, set outside the body, so to speak, is undoubtedly a source of weakness in a draught-horse. An animal with limbs of this sort can have little endurance under hard work. Wide hind action was one of the most notable defects in the earlier London shows of Shire horses. A marked improvement has undoubtedly taken place, yet it is a point to which Shire breeders might with advantage give still closer attention.

Feet.—The foot of the horse is a point of the utmost importance. It is there very often that, under hard labour, the animal first gives way. Flat soft hoofs cannot be durable, and with the persistent striving for large sound feet with deep strong walls, which has been fostered by the show system, the feet of the rank and file of Shire horses have attained a decidedly better character than could have been claimed for the breed prior to the establishment of the Shire Horse Society.

A Typical Shire.—In a paper read before the London Farmers' Club in March 1878 (already referred to), Mr Frederick Street thus describes a typical Shire horse: "The feet should be firm, deep and wide at the heel, not too long or straight in pastern, flat bone, short between fetlock and knee. A stallion should not measure less than 11 inches below knee, and girth from 7 feet 9 inches to 8 feet 3 inches; should not stand more than 17 hands; should have wide chest, shoulders well thrown back, head big and masculine, without coarseness; full flowing mane, short back, large muscular development of the loin, long quarters with tail well set on, good second thighs (this is a point where so many fail), large flat clean hocks; plenty of long silky hair on legs,—or, to sum up in few words, a horse should be long, low, and wide, and thoroughly free from all hereditary disease. A main point is action: he should be a good mover in the cart-horse pace, walking; and, if required to trot, should have action like a Norfolk cob."

In a paper on the same subject, read before the Kingscote Agricultural Association in November 1884, the late Hon. E. Coke thus refers to the typical Shire mare and Shire stallion:—

"If I were asked to look at the mare or filly that you intend breeding from, I should first of all ascertain whether she has side-bones: if they are there, for my part I should not care to trouble myself with any further examination, as I should at once say she is not a mare to breed from; but if she is clean, I should then look at her fore feet, bearing in mind the old maxim, 'no foot no horse.' I should hope to find them rather large, well-formed and open at the heels, not flat, shelly, or contracted; I should like to see rather long sloping pasterns, not short and upright. Rising upwards, the bone from fetlock to knee should be flat, with nice silky hair, big knees and well-developed muscles in the arm, the shoulders well thrown back, although they need not be as oblique as is required in a riding-horse.

"Having done with the fore legs, I should turn my attention to the hind feet. These in the Shire horse are often too small. The Clydesdale horse beats us there; this being the result of careful breeding. I like to find good pasterns behind as well as before. Above the

pastern there should be a good flat bone, topped by a broad, flat, clean hock, and upwards a well-developed thigh, full of muscle.

"Having given you my idea of what the understanding should be, I will not detain you with the less important part of the animal—namely, the body—further than to say I like a good middle: this you will not find unless the mare is what is called well ribbed up. I do not think the biggest mares breed the best foals. They can't be too broad; but they may be too high.

"We now come to the horse to which you intend to put your mare. What I have said of the mare applies equally to the horse; only that he should be coarser and stronger, and the hair, although it should be silky, need not be so fine as that of the mare. . . .

"Before I have done with the sire and dam, let me strongly advise you to try and breed stock as weighty and massive as you can. Some of my friends have told me that, although they admire my horses very much, they think them too heavy for agricultural work. That may be so, and undoubtedly on many arable farms lighter horses would do the work equally well, if not better. Bear in mind, however, that you breed for the best market, and that the agricultural market is not the best. There is a great and increasing demand for horses of the heaviest type, not only in this country but in America and the colonies. It is found that the docks at Liverpool, and the streets of Manchester and other towns, have become so crowded that it is far more convenient to use one horse that can move several tons, than some two or three, which take up so much more room. The same remark applies to New York and other seaport towns in America."

A celebrated Shire Stallion is represented in Plate 4, vol. i.

CLYDESDALE HORSES.

This fine breed of draught-horses has its headquarters in the south-west of Scotland. It is gradually extending into other parts of its native country, and has been exported in large numbers to the United States, Canada, Australia, New Zealand, and other foreign lands. It has risen greatly in value and popular favour since 1877, when the Clydesdale Horse Society was established.

Origin.—The fullest account of the origin and progress of the Clydesdale breed yet written is to be found in the Retrospective volume of the *Clydesdale Stud-Book*. Two theories as to the origin of the breed are advanced. The one is to the effect that the breed is the result of a cross between the native Scotch mares and some Flemish stallions imported into Scotland by one of the Dukes of Hamilton in the seventeenth century. The other version is that the breed has been built up by the careful selection and mating of the best horses and mares in the valley of the Clyde. There is no documentary evidence of the actual importation of Flemish stallions, and although the tradition has obtained a wide footing, it is discredited by the most careful of early writers. Aiton, in his report on the Agriculture of Ayrshire to the Board of Agriculture in 1810, records the tradition thus: "One of the ancestors of the present Duke of Hamilton is said to have imported from Flanders, about the middle of the seventeenth century, six fine black stallions, which he kept at Strathaven Castle for the use of his tenants and vassals. These are said to have greatly improved the breed of horses in the county of Lanark." And in a footnote Aiton remarks: "I have lived many years at Strathaven, where these horses are said to have been kept, and made all possible inquiry into the fact; but no person in that part ever heard of such stallions till they read concerning them in some of the Statistical Accounts of other parishes or similar publications. I am confident that such large horses as they are represented to have been would not, when coupled with the diminutive mares then in that quarter, have raised an improved, but rather an unshapely and unhealthy breed. It must have been better feeding and treatment that improved the breed anywhere."

What part, if any, Flemish blood played in the early history of Clydesdales, cannot now be ascertained with undisputable accuracy. Anyhow, it would seem that, of whatsoever materials composed, the breed was first brought to a high state of perfection in the Upper Ward of Lanark-

shire. The precise time at which the Upper Ward became noted for its draught-horses is not recorded in history, but there is a tradition ("so well supported as to be thoroughly reliable")[1] to the effect that "some time between 1715 and 1720, John Paterson, of Lochlyoch, on the estate and in the parish of Carmichael, grandson of one John Paterson, who died at Lochlyoch in 1682, went to England and brought from thence a Flemish stallion, which is said to have so greatly improved the breed in the Upper Ward as to have made them noted all over Scotland."

Discussing this point, the writers of the historical sketch in the Retrospective volume of the *Clydesdale Stud-Book*, proceed: "The Lochlyoch mares were famous in the Upper Ward during the latter half of the last and the first two decades of the present century; and a Mrs Paterson of Lochlyoch, mother of the present tenant of Drumalbin, now [1878] ninety-seven years of age, still has a recollection of a noted black mare from which many of the best stock in the Upper Ward are descended. The family tradition is strongly supported by the fact that the Patersons were in the habit of noting down important agricultural items from a very early period; and the present representative of the family, Mr Paterson of Drumalbin, has in his possession a family tree of all the descendants of that John Paterson who died in 1682.

"In the year 1836, in reference to a day's ploughing given to one of the Patersons on leaving Lochlyoch for Drumalbin, the following remarks appeared in an Edinburgh newspaper, from which it will be seen that their claim to being the founders of the breed was then recognised. After descanting on the merits of the family and kindred topics, the writer proceeds: 'And it may be here worthy of remark, that it was a brother of Mr Paterson's grandfather who brought the notable stallion from England to Lanarkshire—the sire of the famous Clydesdale breed of horses, of which the county has been so long and justly proud.'

"What were the distinguishing features of the native breed previous to the introduction of the Flemish horse, about 1715, cannot now be definitely determined; but there can be little doubt that they were mostly of English origin and of a mixed character. The old drove-road from Scotland to England crosses the Clyde at Hyndford Bridge, and leads across the hills by Carmichael and Crawfordjohn—the very centre of the then horse-breeding district; and the intercourse which the farmers would thus have with their neighbours from the south, and the amount of traffic done by pack-horses, would doubtless allow of many opportunities for selecting animals calculated to improve the breed.

"The Lochlyoch mares were generally browns and blacks, with white faces and a little white on their legs: they had grey hairs in their tails, occasionally grey hairs over their bodies, and invariably a white spot on their belly, this latter being recognised as a mark of distinct purity of blood. The mares died out at Lochlyoch about thirty years ago.

"The Lochlyoch stock having been long noted in the Upper Ward and largely drawn upon by breeders, there is no doubt that to them, or more correctly to the black horse of 1715, the Clydesdale horse owes its present distinctive character."

Gradually the improved Clydesdale extended its footing, and in 1823, at its show at Perth, the Highland Society for the first time opened a class specially for Clydesdale horses. The wording of the Premium List for the two horse classes possesses a peculiar interest, and merits production here:—

"*First*, For the best Clydesdale or other mare well qualified for working the strong lands, which is brought into or retained in the county of Perth, the *bona fide* property of any landlord or tenant in the county, and to be kept for the purpose of breeding—10 guineas.

"*Second*, For the best Cleveland or mare of any other breed, combining great activity with strength, and otherwise well adapted for draught in the lighter lands, and for producing harness-horses, the *bona fide* property, &c.—10 guineas.

"*N.B.*—The object of the Society in awarding these Premiums in the Second District is to encourage the breeding of—

"*First*, Draught-horses calculated for the strong lands, of which there cannot

[1] *Clydesdale Stud-Book*, Retro. vol.

be a better model than the Clydesdale horse; and

"*Second*, A very active and at same time very strong horse, and which may be adapted, according to circumstances, either for working the land or for meeting the demand for harness-horses of every description, which is at present supplied from England or Ireland. The Cleveland Bays are the basis of such a breed; but the Society does not wish to limit the competition to any particular breed."

The movement which was thus publicly recognised at Perth in 1823 led to increased enterprise in the improvement both of light and heavy horses throughout Scotland. Cleveland Bays were very largely introduced, especially into the northern counties, as well as into several districts in the south-west; "but the Galloways and the Clyde Valley counties remained true to their own particular breed; and when the steam-engine ran the coach-horse off the road, they had their constancy rewarded by the great demand from the cities for horses of the very heaviest description, to meet the increased commercial traffic developed by the railway system."

Thus the breeding of improved Clydesdales has been stimulated by the wants of both town and country, and it is within the mark to say that for many years no branch of Scotch farming has paid better than the raising of a good class of Clydesdale horses.

Clydesdale Horse Society.—The Clydesdale Horse Society has done a vast deal to promote the improvement and the spread of the breed. It has been conducted with much enterprise and forethought, and with several other societies of the kind, has contributed not a little to the greatly increased and still growing wealth of the United Kingdom in its farm live stock. The Society was established in 1877, and issues a volume of the *Stud-Book* every year.

Characteristics.

Colour.—Brown, of a dark shade, and dappled, is the most popular Clydesdale colour. Black is also common, and is highly esteemed, but grey, or very light bay, is not in favour. Neither chestnut nor roan are recognised as Clydesdale colours, and both are disliked and avoided. Latterly the taste for bays has gradually increased, and now this colour is probably quite as common as the darker shades of brown.

White markings are very common. Indeed there are few pure Clydesdales without white on one or more of the legs, and a white star or stripe on the face. The latter, if not so large as to give the countenance a "sickly" appearance, is highly prized.

Size.—The average Clydesdale is not quite so heavy or so high standing as the average Shire. In Scotland more attention has been given to the formation, strength, and soundness of the feet and limbs and to the action than to the weight of the body, while in England the body was for long the first and main consideration. The average height of the improved Clydesdale is about 16 hands 3 inches, several stallions reaching, but very few exceeding, 17 hands, which is a common height amongst the Shires.

The general features of the improved Clydesdale are admirably described in the following notes, which we take from the Retrospective volume of the *Clydesdale Stud-Book*:—

Head.—The typical Clydesdale "has a broad jaw, ending as a rule in a not very fine or well-tapered muzzle, but with large open nostrils. His eye is usually full and vigorous, yet mild; his forehead broad and full between the eyes; while from the eyes the forehead tapers gradually upwards to the ears, which are long and active. Breeders of Clydesdales should attach considerable importance to these points, as a horse of such a description will generally be found to be of excellent temper, easily trained, and very wise in cart or plough.

Neck and Shoulder.—"Experience alone can teach one when the head is well set on to the neck; but the latter should be strong, massive, and of medium height, while the shoulder should be more oblique than in the English draught-horse. This, indeed, is one of the distinctive features of the Clydesdale, as to his formation of shoulder is largely owing his long quick step, for which he is so justly admired. . . .

Fore Leg.—"Good sound feet and

legs are essential to all horses, and are certainly not undervalued in the Clydesdales—in fact, some judges, in their admiration of such good qualities, frequently lose sight of the 'top' altogether.

"Quite as essential as the slightly oblique and closely topped shoulder of the Clydesdale for his long quick step is a strong forearm. This part, from a side view, should be broad, loaded with long strong muscles, so as to give him full power to bring forward the part beneath, and in length should be proportionate to the length of the shoulder. A flat and broad knee is also essential; but this is a point sometimes overlooked by the best of Clydesdale judges, who prefer strength of bone immediately under the knee in many horses, and so the leg comes to the ground as if there were no joint between the elbow and the pastern.

"Deficiency of bone under the knee has not unfrequently caused the rejection of many good horses in the show-yard in favour of animals which happen to be thicker at that particular place, yet have not half the strength, owing to the bone not being of the proper shape, or to the entire absence of sinew The shank-bone should be flat from a side view, and tapering to an edge as it goes back.

Feather.—"The back of the fore leg from the knee down should possess a nice flowing fringe of silken hair, which should spring from the very edge of the bone. This hair should be of what a judge of a Skye terrier would term a 'pily' nature; and good judges will not have a horse at all the feather of which has a coarse matted appearance. Possibly too much attention is paid by Clydesdale breeders to this point, and many will not exhibit at certain shows, because their horses at the particular time happen to be what they term 'bare of hair.' The hair certainly creates a false impression of strength of bone, as an animal which has a broad forearm and well-developed knee, if deficient in feather, does not compare well with one possessed of a nice flowing fringe several inches long, and this is decidedly disadvantageous; but the high value set upon nice silky hair is on account of its being in all cases a certain indication of a strong healthy bone, as the hair of a short, coarse, matted kind suggests a decided tendency to grease.

"All horses have a tendency to lose their hair when being put into show condition (*i.e.*, loaded with fat like a bullock), and so 'blistering,' it is to be regretted, is sometimes resorted to to strengthen its growth. The hair produced by this process is not, however, so silken or so fine as the natural, and the difference is easily detected by the practised eye.

Sinews.—"The sinews of the leg should be thick, strong, thrown well back from the bone, and capable of being felt with the hand; if not, the leg is not a good one, however thick, as a soft round leg, in which the sinews are not well defined, will not stand work.

Pastern.—"The lower end of the shank-bone or fetlock should also be large in all, so as to give full play to the tendons; and Clydesdale judges are also very particular as to this, and also to the pastern, which during the last few years has come in for a large share of attention. Youatt, writing on this point, says: 'The concussion which attends the common action of the cart-horse is little, because his movements are slow, and therefore the upright and strong pastern is given to him, *which he can force into the ground*, and on which he can throw *the whole of his immense weight*.' If Mr Youatt had ever seen a draught-horse in the streets of Glasgow, or any other large town, 'forcing his upright and strong pastern' into the granite pavement, he would possibly have halted before he wrote the above sentence. . . . Short upright pasterns always get worse with age and feeding, and the action in due course of time becomes impeded. A horse with an upright pastern has little or no command of his foot, and literally walks as on a crutch; and if he has no power of his foot he cannot have much in his shoulder. The streets of Glasgow are very trying to horses, which have to scramble for a footing in the furrows between the hard smooth paving-stones; and horses with upright pasterns are sometimes almost powerless to move, where those with pasterns moderately sloped, and of a medium length, can walk

with comparative ease. Farmers around Glasgow are alive to this, and will not readily use a stallion which has this defect, however strong and shapely.

Foot.—"Without a good, sound, well-shaped, healthy foot, a horse is of no use at all, however symmetrical and strong. The Clydesdale is generally sound on that point, though subject, like all other breeds of the equine genus, to its various diseases. Side-bone and ring-bone are said by veterinary surgeons to be less common than in the cart-horses of the south.

Back.—"An undue length of back is not an uncommon defect in the formation of the Clydesdale, and flat badly sprung ribs—the last of the latter occasionally very short—form defects which it should be the object of breeders to remove. The back is not unfrequently low, and the horse at first sight looks as if he had no command of himself, the barrel merely forming a bridge between the fore and hinder ends.

"Latterly this defect has been much modified. The most popular stallion in recent time was Darnley, 222, and one very striking characteristic of his immediate and more remote descendants is their roundness of barrel, depth of rib, and lofty formation of shoulder.

Chest.—"The chest is generally low, broad, and full, if the body is large and round-ribbed; if not, it is narrow, and the horse has a 'wedgy' appearance, and in street traffic this want of breadth places him sometimes, in rounding corners, under command of the shafts of the waggon or lorry if at all heavily laden.

Hind Quarters.—"Broad, low-set hind quarters, with muscular thighs, descending into broad and proportionately developed hocks, sum up the good points of the hind end of the Clydesdale.

Hocks.—"Narrow hocks are so subject to thorough-pin, &c., that most breeders avoid them, though there should be no perceptible marks of unsoundness. Straight hocks are not liked; but if the other parts are proportionate and the action sound, no exception is taken to this formation. It is as a work-horse, however, that the Clydesdale should be considered, and it is questionable if a straight hock affords as much propelling power as one moderately bent. The muscles surrounding the hocks should be strong and firm, and objection is always taken to animals which have them loose and flabby, or which, to use a breeder's phrase, have 'fleshy hocks.'

Hind Leg.—"From the hock to the ground the leg should be short, broad, flat, clean, evenly and straight or slightly inclined forward; the sinews standing out from the bone, and having a similar fringe of hair to that on the fore leg, and rising as high as the bottom of the hock-joint.

Hind Pastern.—"The hind pasterns are a little larger generally than the fore ones, and are more inclined, but not so much as to give the idea that they are not supporting the quarters. Short steep hind pasterns are a very bad fault, as the animal is always sticking its toes into the ground.

Action.—"In walking, the horse should, if approaching you, come with his head well carried and with an apparently measured stride, lifting his feet well off the ground, and placing them down again regularly, evenly, and with apparent deliberation.

"On a side view one can notice if his action be even—*i.e.*, if his fore and hind action be in unison—for in horses with long backs and weak loins the two ends seem to be under different control, and the hind legs being in a manner dragged with the toes along the ground, an unpleasant effect is produced.

"In going at a walk, a horse should plant his hind feet forward as deliberately as his fore ones, at the same time raising and bending the leg at the hock, which should be evenly carried forward. If the hocks are turned out in moving them forward, the action is not good; and a Clydesdale breeder considers this an exceedingly bad fault in either horse or mare, though it is one which is [used to be] commonly overlooked south of the Tweed.

"In trotting, the horse should bend the legs at the knees and hocks, and from a hind view the inside of the fore hoofs should almost be seen at every step. If the animal be inclined to move wide behind, this fault will be easily discovered at the trotting pace."

A horse that goes wide behind generally gives a more favourable impression at the trot than walking.

A noted Clydesdale Stallion of modern times (1890) is represented in Plate 3, vol. i.; Plate 5, vol. i., a typical Draught Stallion of 1840; Plate 7, vol. i., a typical Draught Mare of 1840; and Plate 6, vol. i., a Draught Horse of 1840.

SUFFOLK HORSES.

The Suffolk Punch is a distinct type of horse. It has its headquarters in the county of Suffolk; but although it has long been held in high esteem there, it has never obtained an extensive footing beyond the south-eastern counties of England.

Historical.—As to the origin of the Suffolk Punch, various accounts have been given. Low says: "The colour distinctive of this variety connects it with the race widely diffused throughout the north of Europe and Asia, from the Scandinavian Alps to the plains of Tartary, in which the dun colour prevails. It is believed to have been carried to the eastern counties of England from Normandy, which yet possesses many fine horses of this variety, introduced, it may be believed, by the Scandinavian invaders."[1]

Arthur Young was a native of Suffolk, and in his report on the Agriculture of this county, compiled about the end of the eighteenth century, he speaks of "the old breed" of horses as if it had been specially associated with the district long prior to that date. Writing in 1878, Mr Herman Biddel says: "Two hundred years ago there were draught-horses peculiar to the county, and of standing enough as a distinct breed to maintain their prevailing characteristics through generations of descendants, long after the original type had been considerably modified by repeated selection, and the introduction of incidental crosses. How long prior to Young's time the breed had existed we have no evidence to show."[2]

Continuing, the same writer says: "Up to the present time [1878] there has been no stud-book of the Suffolk horse: an association is now, however, under the presidency of Lord Waveney, formed for the purpose of collecting information as regards pedigrees, and publishing a first volume or registry, from which it is proposed to carry on in future a regular stud-book. Through the courtesy of the secretaries we have been favoured with the loan of some MSS., from which it clearly appears that there is scarcely a Suffolk stallion in the county, of any note whatever, whose pedigree is not clearly to be traced in a direct male line for seventy years. The records in the possession of the association, which relate to a period between 1790 and 1810, throw some light on the matter, and point to the introduction of materials not ill calculated to bring about the transformation that has taken place. Infusion of the Thoroughbred, Flemish, and heavier blood of native horses, has tended to exert upon the 'old breed' the influence such elements would be likely to produce; but as far as a careful search through the lineage of the horses now extant in the county will show, not one seems to have inherited the alloy in the male line, all of which terminate in an ancestry in all probability tracing back to the old breed mentioned by Arthur Young."

Characteristics.

Colour.—The colour is the most distinctive feature in the Suffolk breed. It is a light dun or sorrel, sometimes, as Low has it, deepening into chestnut, with lighter coloured mane and tail.

Form.—Arthur Young did not seem to have a high opinion of the breed. He cuts it off with this sarcastic touch: "Sorrel colour; very low in the fore end; a large ill-shaped head, with slouching, heavy ears; a great carcass, and short legs: an uglier horse could hardly be viewed." Now, however, the breed is more gainly, although it is still a thick, chubby, or punchy animal, with a body disproportionately large for the length of its limbs. Its legs are stout, but rounder in the bone than is considered desirable for maximum strength. The "feather" has not been cultivated on the Suffolk Punch, and so its legs are free from the long hair which characterises the legs of the Shire and Clydesdale horses.

Aptitude for Work.—The Suffolk Punch is a most faithful servant. It is probably the hardest puller of the equine

[1] *Domestic Animals of British Isles*, 619.
[2] *Live Stock Jl. Alk.*, 1878.

race. A true Punch of the olden type was a "dour," dull, determined creature; it would tug and pull till it dropped down, rather than give in. It is mentioned by Low and other writers that this property was so remarkable in the old Suffolk Punches, that cruel wagers used to be laid on their powers of draught, and many fine horses were thus ruined by their indomitable spirit.

The modern Punch retains not a little of this useful attribute, and it is vastly improved in the important matter of action. It is a hardy animal, and an excellent feeder. Horses of the breed are now highly esteemed for van and dray work in towns, although under heavy loads on hard streets they do not wear quite so well as the improved Shire and Clydesdale horses. They are capital farm-horses, especially for tillage work.

CLEVELAND BAYS.

Cleveland Bay horses have played an important part both in road and farm work. The following notes regarding them are from the pen of Mr W. Scarth Dixon, hon. secretary of the Cleveland Bay Horse Society:—

The value of a breed of horses with size, action, power, and a hardy constitution, and at the same time clear of carting blood, is incalculable; and such is the Cleveland Bay, or, as it was formerly called, the Chapman horse. The latter name seems the more appropriate one of the two, as in a word describing the "general utility" horse; whilst the modern name is merely derived from the district which became famous for containing the best specimens of the breed.

Origin.—The origin of the Cleveland Bay has exercised the ingenuity of several writers, who have puzzled themselves and their readers in vain efforts to account for the existence of the Cleveland Bay by promulgating elaborate theories of crossing between the thoroughbred stallion and the cart-mare. It is unnecessary to enter into minute detail respecting these theories. The very conformation of the Cleveland Bay clearly points out that he cannot be descended from the cart-horse, the elegance of his quarters especially showing that there can be no kinship between them; whilst the way in which, as a rule, the Cleveland Bay breeds to type, both in colour and conformation, precludes the possibility of his being the result of an elaborate system of crossing between the thoroughbred and the cart-horse. Practically the Cleveland Bay is as fully entitled to be termed a pure breed as any breed of domestic animals, and there seems every reason to believe that it is descended in direct line, with importations of foreign blood perhaps, from the aboriginal horses of Britain.

It is very probable that the Cleveland Bay derives a certain proportion of his courage and endurance from a pretty large infusion of Eastern blood, which doubtless did take place in the earlier years of the Christian era.

It is also possible that the Cleveland Bay may have been crossed with the Scandinavian horse during the time that the Danes effected a settlement on the north-east coast of Yorkshire.

Characteristics.—The Cleveland Bay is a short-legged horse, standing from 16 hands to 16 hands 3 inches, seldom being found under the one, and only a few specimens being met with that exceed, or even attain to, the other. His head is rather plain, but is well set on, his neck is well placed, and his shoulders generally lie well back. His back is rather long, from the standpoint of a riding man, but it is strong and muscular; his quarters are long, level, and elegant; and his tail is well put on and well carried. He is remarkable for the quality of bone, which is as clean and flat as that of a race-horse, and his legs are almost clear of hair. His action is of a high standard of excellence, both in a walk and a trot; and although he has none of that knee action so much admired by the lover of the hackney, he moves his shoulders and hocks in rare style, and in a manner highly suggestive of getting over the ground.

The following description of a Cleveland Bay stallion that did good service in the country in which he was located, is taken from the first volume of the *Royal Agricultural Society's Journal*, and is from the pen of Mr J. B. Lloyd, a celebrated Gloucestershire agriculturist. "When old Cleveland was at his full size," says he, "he measured

16 hands 1½ inch high, 9⅜ inches round the pastern, 10 inches round below the knee, 21 inches round the arm, 15⅝ inches round the knee, and 6 feet 10 inches round the girth. When measured he was in good condition, but not what you would call full of flesh, his legs as clean as a race-horse."

The Cleveland Bay is a capital worker, and on light land he cannot be beaten, whilst his great activity and hardy constitution make him able to hold his own with the heavier cart-horse on all but the very stiffest clays. He can also run in his master's gig, and I have occasionally seen some of the best specimens running in a gentleman's carriage, though the present fashion is in favour of a lighter and more stylish animal. They are not often used as saddle-horses now, but occasionally a farmer in the Yorkshire dales may be seen riding one to market. Formerly, however, they were much used as hacks in Yorkshire, especially in the North Riding; and occasionally one was found that could carry his owner creditably to hounds.

Value for Crossing.—The value of the Cleveland Bay for crossing with other breeds is difficult to estimate, and to this very fact is to be attributed in no small measure that falling off in the numbers of the pure breed which a few years ago nearly led to its extinction. It was used in Scotland in the early part of the present century to improve the breed of agricultural horses in that country, and with as satisfactory results as seem to have attended Mr Lloyd's Gloucestershire enterprise. Valuable ride and drive horses have also been bred by crossing a short-legged hackney sire with a Cleveland mare; and Cleveland mares crossed with a thoroughbred horse have bred some of the best hunters that ever went out of Yorkshire. Great care, however, is required in the selection of a stallion. The latter should be of an active, wiry character, with good shoulders, and a short strong back, and rather under than over 15 hands 3 inches. Especial care should be taken to select a horse with short legs, this being a far more important matter than size, which is rather to be avoided, even if the horse is ever so well put together. The second cross from a Cleveland mare makes the best hunter as a rule, retaining the size and substance of the Cleveland, and naturally possessing more quality and pace; but after the second cross the tendency is for the breed to lose size and degenerate. As an instance of the value of the Cleveland Bay as a foundation for breeding hunters may be cited the fact, that some of the best hunters bred by Lord Middleton at Birdsall are third in direct descent from a Cleveland mare.

Yorkshire Coach-horse. — The Yorkshire coach-horse is an offshoot of the Cleveland Bay, and originated in the demand which sprang up in the earlier years of the present century for big flash carriage-horses. The short-legged compact Cleveland mare was crossed with a big, lengthy, and flash thoroughbred horse; the produce, whether horse or mare, was bred from, and eventually the Yorkshire coach-horse, or — as he was sometimes called, from the locality in which he was principally bred—the Howdenshire Cleveland, became recognised as a distinct breed. Possessing the length and fine level quarters of the Cleveland bay, as well as others of his good properties, the coach-horse also has much of the elegance of the thoroughbred. He is apt, however, to grow leggy in the course of a few generations; what is gained in quality is lost in bone; and recourse has to be had to the old breed to restore that substance which is so essential in a good coach-horse. From the Cleveland Bay and the coach-horse are bred a large proportion of what are known in the trade as London carriage-horses: the larger and stronger animals being bred from mares of the former breed and sired by either thoroughbreds or coach-horses; whilst the lighter and lesser horses are bred from mares of the latter breed, and sired either by coach-horses of high quality or by thoroughbred horses of a coaching type.

Latterly an attempt has been made, but without success, to prove that the Cleveland Bay is not a pure breed. Absolute purity of breeding cannot, and does not, exist; but a breed which has existed for centuries without admixture of foreign blood, transmitting its characteristics in so remarkable a manner as the Cleveland Bay has done and continues to do, is fairly entitled to rank

amongst the pure breeds of British horses.

A noted modern Cleveland Stallion is represented in Plate 8, vol. i.

THE HACKNEY HORSE.

The Hackney horse, sometimes known as the Norfolk Trotter, is a most useful animal on the farm. It is useful not only for the farmer's trap and for riding, but also for light spring-cart work. The term Hackney is now understood to include riding-horses (other than thoroughbreds and hunters and small ponies), no matter what may be their height.

Mr H. F. Euren, secretary to the Hackney Horse Society, writes:—

Historical.—The name Hackney came in with the Normans, but the old Danish name Nag held its own. Hackney was applicable only to a pacing or trotting horse, while nag was and is used as a name for any riding-horse.

Hackneys and Trotters are frequently mentioned in old farm accounts from the year 1331 to 1518 (Thorold Rogers's *History of Agriculture and Prices*). In 1340, by 14 Edward III., s. 1, c. 19, one of three Acts passed to regulate purveyance and to make illegal the practice of sending the "king's great horses" on to farmers' lands; but there was reserved to the king's Master of the Horse privilege of purveyance for "a Hakeney," which he might have: in the Paston Letters, under date 1470: in Acts of Henry VIII.—1535-36, 1540, 1542—the last-named providing that cart-horses or sumpter-horses were not to be reckoned as trotting horses: by Blundeville, the Norfolk parson, who was the first English writer on horses (A.D. 1558): by Thomas de Grey, *The Phœnix of our Times* (A.D. 1624), who spoke of the trotting horse as the English breed of horse, the troop-horse of his day.

The Hackneys of the eighteenth and nineteenth centuries trace back, almost without exception, to one horse, named "Shales," foaled about the year 1755. His sire was "Blaze." The sire of "Blaze" was "Flying Childers," which horse was a mixture of Barb and Arab blood. The dam of Blaze, known as "Confederate Filly," had Barb or Turk blood in equal proportions with English blood of unknown breeding. The dam of "Shales," as of "Hopeful," another son of "Blaze," was a trotting mare.

From 1750 to 1780 Barb blood was freely used in Norfolk on trotting mares. The horse "Shales" is said in an old advertisement to have been "the fastest horse of his day." Through his get, "Scot Shales" and "Driver," came all the famous "Shales" and "Fireaway" stock of the end of the eighteenth century. Many of the good ones were bred in the Long Sutton district. The "Driver" stock first won popularity in Yorkshire—the "Shales" stock in Norfolk; but there was a regular interchange of the two strains from the outset. Their descendants, Burgess's "Fireaway," Wroot's "Pretender," and his son, Ramsdale's "Performer," Bond's (two) "Norfolk Phenomenon," Chamberlain's "Marshland Shales," and the "Norfolk Cob" family, are a few of the horses existing between the years 1788 and 1850, whose names occur often in the full pedigree of the horses which have won the Society's champion honours.

Notwithstanding that examination of an extended pedigree shows that the modern Hackney is frequently an inbred horse, it is claimed for the breed that it retains its old-time characteristics—good action, high courage, and great powers of endurance. M. de Thannberg, who for nearly forty years was connected with the Government Studs in France, declared in 1873 that the Norfolk Trotter had transmitted these very qualities to the French horses, and thus established what is now known as the French coach-horse. The old custom of trotting against time and in matches, which prevailed in England in the early years of this century, having been discontinued, the qualities which won for the Hackney its old reputation are not now so plainly in evidence; but those who have a knowledge of back-breeding have no difficulty in selecting horses which shall transmit the old-time powers to the progeny.

Practice of Breeding.—The practice of the breeders of the Hackney, as shown by records from 1780 to 1820, was that of using the Hackney stallion on half-bred mares, the produce of thoroughbred stallions and trotting mares. This has continued to be an

almost universal practice in Yorkshire. In Norfolk there have been experiments made of using thoroughbred stallions on trotting mares, and the result has not been so satisfactory as is the breeding in Yorkshire, as regards form, endurance, or action. The most experienced breeders are agreed that the truest mode of breeding Hackney stallions, so as to get a certain result, is to put the necessary thoroughbred blood into the breed through the mare, and better still through her dam. The examination of hundreds of pedigrees received from Yorkshire has shown me that in a very small proportion of cases—certainly not more than two per cent—Yorkshire breeders have followed this plan of using Hackney stallions — putting thoroughbred blood into the breed through the mares only. One of these Yorkshire-bred horses, known as "North Star," which was exported by Col. Barlow in 1860 to the Austrian Government, and which I find, on examination of the pedigree, had only two parts in 64 of thoroughbred blood, was found so pre-potent that he has stamped his characteristics on hundreds of horses in the district of Austria in which he was used, so that it is common there to hear a horse spoken of as a North Star. The breeding of two of the most successful stallions—Mr W. Flanders's "Reality" and Mr Henry Moore's "Rufus"—each a winner of a champion cup at the Hackney Society's London show, confirms me in my previously formed opinion. "Reality's" dam was sired by a thoroughbred, but there were three previous generations of the best Hackney blood. His sire had thoroughbred blood in the fourth generation only, and then through mares. "Rufus's" granddam was sired by a thoroughbred, and her dam was Hackney bred. On his sire's side the thoroughbred blood came in five generations back, and only through the dam.

Hackney Horse Society.—The Hackney Horse Society was organised in 1883 and incorporated in 1884, not only to provide a stud-book for the record of the breed, but also to ensure to the public that the horse used shall be on both sides of the best blood, and sound in every respect. The Society holds an annual show in London. The strictest regulations are enforced to guarantee the soundness of the horses which receive any distinction, whether of prize or commendation. The proportion of unsound horses has been found to be very small. The show is also doing a very great deal towards a return of the Hackney to its old place as a riding-horse without any lessening of the action for which the Hackney has always been famous. The Society, which at the end of its first year had 290 members, ended its eighth year with 1000.

CATTLE.

The British Isles have long been famed amongst the nations of the earth for their wealth in cattle. Nowhere else has the systematic breeding of farm live stock been carried on so persistently and successfully as in this country. Our soil and climate, as well as the habits and tastes and skill and enterprise of our people, are all peculiarly adapted to the industry. In the breeding of cattle in particular, our farmers have been singularly successful. For many years the improved breeds of British cattle have been largely drawn upon by numerous foreign countries for the amelioration of native races; while the improvement effected in the general cattle stock of Great Britain since 1830 has added greatly to the agricultural wealth of the nation.

There are over a dozen breeds of cattle in Great Britain usually regarded as distinct varieties. In England there are the Shorthorn (also widely diffused through Ireland and Scotland), Hereford, Norfolk and Suffolk Red Polled, Devon, Sussex, and Longhorn breeds. In Wales there are several varieties, such as the Pembroke (or South Wales or Castle Martin) breed, the Anglesea (or North Wales) breed, the Glamorgan breed, and the Old Castle Martin White breed. The first two are the principal varieties. Scotland claims the Polled Aberdeen-Angus, the Polled Galloway, the Ayrshire, and the West Highland breeds. Ireland has its one pure native breed, the Kerry, with a sub-variety in the Dexter. The cattle of the Orkney and Shetland Islands are distinct in form and

attributes from the races of the mainland. The Jersey and Guernsey breeds are now so thoroughly acclimatised in England and Ireland as to be entitled to mention amongst British cattle.

A notable feature in stock-breeding enterprise in recent times has been the establishment of herd-books for the recording of pedigrees. Almost every one of the breeds named above has now its own herd-book, and there is no doubt that the influence of this movement has been highly beneficial. The great majority of the cattle of the country are still of mixed breeding, but the number of animals with recorded pedigrees is now far greater than ever before, and is steadily increasing.

SHORTHORN CATTLE.

The shorthorn has abundantly earned the right to the premier position amongst British breeds of cattle. It is by far the most numerous, as it is the most widely diffused. More wealth is bound up in it than in any other variety of the bovine race. In the development of the live-stock industry of the British Isles, it has played a great part, far exceeding that of any other distinct class of animals. And it has done more than develop wealth at home. It has gone in vast numbers to foreign countries, bringing in exchange foreign gold to the British farmer, and creating wealth, and promoting pastoral prosperity wherever it has appeared. The breed which has done all this—and is as busy at work as ever, widening its field of operations from day to day—well merits a word of homage from the live-stock historian.

Origin and Progress.—The credit of giving to the world this fine race of improved cattle belongs to the north-east of England,—in largest measure perhaps to the county of Durham. It is probably right to regard the county of Durham as "the cradle" of the shorthorns. They have often been spoken of, both at home and abroad, as the "Durham Breed," yet the valuable race of native cattle from which the improved shorthorn was raised were the prevailing class of stock kept in the adjoining counties as far back as reliable history enables us to trace their career. It was also common in the early days of shorthorn fame to speak of them as "Teeswater Cattle," this habit of course arising from the fact that several of the most famous earlier improvers of the breed lived in the valley of the Tees.

We believe the fact may be accepted as undeniably established that the improved shorthorn is in the main a direct descendant of the aboriginal cattle of the north-east of England. It is stated that some centuries ago a cross was introduced from some of the large-framed breeds of the continent of Europe, notably Holland and Denmark. It is known that in more recent times—to wit, early in the nineteenth century—an infusion of alien blood was taken from other British breeds.

These extraneous dashes of blood, however, have been but as drops in the ocean. In the swelling tide of pure shorthorn blood they have long since lost their distinctive force, so that for all practical purposes the pure-bred shorthorn of to-day may be taken as the direct descendant of the ancient cattle of the north-east of England.

Early Improvements.—The first to begin the systematic improvement of the shorthorn breed were the brothers Charles and Robert Colling, who were probably busy at this important work at the dawn of the nineteenth century. We are told that in those days the great majority of shorthorn cattle were large high-standing animals with good milking properties, but rough in form and slow in fattening. The Collings at once directed themselves to the improvement of the cattle where they were most defective, and there is ample evidence to show that very early in the nineteenth century these pioneer breeders had succeeded in establishing herds of cattle which were decidedly superior to any others in the country. From the earliest glimpses we get of the Collings cattle, we learn that, in comparison with the unimproved cattle of the district, they were wider in the rib, more symmetrical in the frame, shorter in the leg, slightly smaller in size, heavier in flesh, and much more speedy in growth and in the accumulation of flesh and fat.

As to the methods of breeding followed by the Collings, there has been a good deal of speculation. It is asserted by

some writers—but there is no absolute proof in support of the assertion—that in improving the native cattle the Collings introduced an infusion of blood from some of the other smaller breeds of the country. We do not presume to controvert this suggestion. We are, however, more inclined to the belief that the Collings relied upon "selection" in breeding—that is, upon the mating of the animals of the shorthorn breed which most nearly approached to their ideal of character, and fixing the type by pursuing what is designated "in-and-in breeding." This system of "in-and-in breeding"—that is, the mating of animals which are closely related to each other—is well known to assist greatly in stamping or fixing peculiar features and characteristics upon races of stock. The Collings, we have reason to believe, soon discovered this, and it is clear to us that they employed with great skill and discrimination this somewhat uncertain agent, which, according to the manner in which it is directed, is possessed of great power for good or evil.

But whatever may have been their method of breeding, it is well known that the success of the Collings was both speedy and complete. The fame of their cattle spread so rapidly, that in the first few years of the nineteenth century they were obtaining the hitherto unheard-of price of £100 each for cows and bulls of their improved strains.

Ketton and Barmpton Sales.—Charles Colling's historical sale at Ketton in 1810 is usually spoken of as the first great public sale of shorthorns. On that historical occasion twenty-nine cows and heifers realised an average of £140, 4s. 7d., while the average attained for eighteen bulls was £169, 8s. each. The crowning sensation was the purchase of the renowned bull "Cornet" for the fabulous sum of 1000 guineas. An equally important event took place eight years later, when at Robert Colling's sale at Barmpton, notwithstanding the fact that the time was one of great depression, the herd of sixty-one animals realised an average of £128, 9s. 10d.

Lovers of this fine race of cattle delight to dwell upon the doings of the brothers Colling, and there is little wonder that this should be the case. The importance of the work which was taken up and carried on by them can hardly be overestimated. At the present day there is not a well-bred living shorthorn in whose pedigree Colling blood does not figure prominently—marvellous testimony, surely, to the importance of the work done by these two great men.

Booth and Bates Shorthorns.—The most famous of the Collings' more immediate successors were Thomas Bates and Thomas and John Booth, names which have long occupied prominent positions in connection with shorthorn cattle. At the Ketton sale in 1810, Thomas Bates purchased the two-year-old heifer, "Old Duchess," for 183 guineas. Thomas Booth bought the bull "Albion" for 60 guineas, while at the Barmpton sale in 1818, his brother John Booth purchased the yearling bull "Pilot" for 270 guineas. With these purchases the shorthorn breed drifted into two great channels, which by degrees absorbed the main current of the race. These two strains of Bates and Booth, as we have thus seen, had one common origin in the stock of the brothers Colling. In the hands of their new owners the strains developed distinctive shapes and characteristics, which in the purer representatives are still maintained and easily recognised.

The Bates cattle, says Mr Robert Bruce, "are higher-standing, better-milking, and perhaps gayer-looking cattle than the Booths. They have as a rule more upright shoulders, flatter fore ribs, opener sides, with long hind quarters, less fully packed with flesh than the rival strain. As a rule their heads are clean cut and pretty wide, while the bulls have long arched muscular necks and keen tempers. The prevailing colours in this strain of blood are, generally speaking, deeper than in the other, being reds and rich roans. The Booth cattle are wider, deeper, and perhaps less pretty. Their shoulders are more laid back, their fore ribs and flanks deeper and better filled. They are more a beef than a milk breed, with well-packed quarters and thick loins. The sires remind one more of a fat Smithfield ox, and they move without that courage and dash so pecu-

liar to the 'Duke's' and other highly valued strains of the Bates tribes."[1]

But while the Booth and Bates are the two chief strains of pure-bred shorthorn cattle, they do not by any means embrace the whole. Beyond these there are many excellent herds and families of shorthorns which show but little leaning either to Booth or Bates, and which are, in their own way, equally meritorious and useful. Chief amongst these must be mentioned the "Cruikshank" families, long maintained and bred with great success by the brothers Cruikshank at the farm of Sittyton, in the county of Aberdeen.

Colour.—Roan of varying shades is the prevailing colour of shorthorn cattle. Many of them are red of different hues, and a considerable number are white. The last-named colour is decidedly unpopular; but the objection to it is by no means well founded. Not a few shorthorns are red and white, the patches of red and white being distinct from each other. This colour is also objected to, and breeders strive to avoid it as far as possible.

Characteristics.—Enough has been said at the outset of this notice to indicate that the attributes of the shorthorns are of the very highest order. Indeed, in the production of meat and in general utility the shorthorn is unsurpassed. It may be excelled by some other varieties in special aptitude for peculiar purposes, or for certain limited districts, but for a combination of all the more useful properties of domestic cattle, as well as adaptability to varying conditions of soil, climate, and treatment, there is no other breed of cattle that can equal the shorthorn. With remarkable facility the shorthorn adapts itself to extremes of soil, climate, and management, and this characteristic, combined as it is with another valuable property which the breed possesses in an unequalled degree—namely, suitability for crossing with and improving other and inferior races of cattle—has spread the improved shorthorn far and wide, not only in the British Isles, but also in many foreign lands. In North and South America, in the continent of Europe, in Australia, New Zealand, and other countries, the shorthorn has been extensively introduced, and has been employed with great success in the improvement of native races of cattle. The particular mission of the improved shorthorn would seem to be to remove or make up for the deficiencies of other breeds. Its remarkable adaptability for crossing with and improving other varieties of cattle has imparted to it quite exceptional value and celebrity. The great bulk of improved shorthorns have therefore, during the existence of the race, been employed as indirect as well as direct agents in the production of meat—in bringing meat out of other races as well as raising it upon their own frames.[2]

Milking Properties.—The milking properties of improved shorthorns vary greatly. Many breeders of shorthorns have unfortunately cultivated the fattening to the detriment of the milking property, carrying on this one-sided development much further than was either necessary or desirable. It is thus by no means uncommon to meet with shorthorn cows which are greatly deficient in milk production. Taking the breed as a whole, however, it is still fairly satisfactory in this point, while the majority both of pure-bred shorthorn cows and of crosses from the breed are entitled to rank as heavy milkers. Good shorthorn cows give from 700 to 1000 gallons of milk in twelve months, and occasionally much higher yields are obtained.

Weight and Early Maturity.—The improved shorthorn has all through its recorded history been noted for its precocity. It grows rapidly, attains great weight, and accumulates flesh and fat with great rapidity. At the Smithfield Fat Stock Show in December 1887, the class of shorthorn steers under two years old (averaging 672 days each), gave an average live-weight of 1396 lb. Shorthorn steers over two years and under three years of age (averaging 988 days) averaged 1870 lb.; while shorthorn steers over three years old (averaging 1321 days) gave an average live-weight of 2116 lb. each.

[1] *Chambers's Encyclopædia*, article on "Cattle" by James Macdonald.

[2] "Shorthorns in Scotland and Ireland," *Journal Royal Agricultural Society of England*, by James Macdonald. Vol. xix., part I., 1883.

Points of the Shorthorn.—The following description of the points of the improved shorthorn is from the pen of the late Mr Henry Strafford, editor of *Coates's Herd-Book:* "The head of the male animal is short, but at the same time fine, very broad across the eyes, but gradually tapering to the nose, the nostril of which is full and prominent—the nose itself of a rich flesh-colour, neither too light nor too dark; eyes bright and placid, with ears somewhat large and thin. The head, crowned with a curved and rather flat horn, is well set on to a lengthy, broad, muscular neck; the chest wide, deep, and projecting; the shoulders fine, oblique, and well formed into the chine; fore legs short, with the upper arm large and powerful; barrel round, deep, and well ribbed up towards the loins and hips, which should be wide and level; back straight from the withers to the setting on of the tail, but still short—that is, from hip to the chine—the opinion of many good judges being that a beast should have a short back with a long frame. As a consequence of this, the hind quarter must itself be lengthy, but well filled in. The hair is plentiful, soft, and mossy, with a hide not too thin, and in fact something approaching the feeling of velvet. The female enjoys nearly all the same characteristics as the above, with the exception of her head being finer, longer, and more tapering; her neck thinner, and altogether lighter; and her shoulders more inclined to narrow towards the chine. Like most well-proportioned animals, the shorthorn often looks smaller than he really is."[1]

A famous Shorthorn Cow of modern times (1890) is represented in Plate 9, vol. i. Plate 10, vol. i., represents a Shorthorn Bull of 1850. Plate 11, vol. i., represents a Shorthorn Ox of 1850; and Plate 12, vol. i., Shorthorn Cows of 1840.

HEREFORD CATTLE.

This handsome breed of cattle has its home in the English county whose name it bears. No other variety of stock in the British Isles displays more distinctively marked characteristics than the improved Hereford, which is as widely noted for its picturesqueness and beauty as for its practical utility.

Origin.—The generally accepted opinion as to the origin of improved Hereford cattle is, that they trace directly from the aboriginal cattle of the county of Hereford and adjoining districts. The improvement was begun far back in the eighteenth century, by the Tomkins family. There is abundance of evidence to show that, as early as 1766, it was taken up in a systematic manner by Benjamin Tomkins, who continued the work with great energy and success until his death in the year 1815. For four years after, his herd was maintained by his daughters, and when it was dispersed by public auction in 1819, one year after the famous Barmpton sale of shorthorns, twenty-eight breeding animals realised an average of £149 per head—four adult bulls bringing £267, 15s. each, and two bull-calves £181, 2s. 6d. each.

Other early breeders of skill and enterprise took up with commendable spirit the work which had been so well begun by Tomkins, and to their successful efforts the Hereford farmers of to-day are indebted for a valuable race of rent-paying cattle.

It is generally considered that infusions of foreign blood have contributed to some extent to the building up of the improved Hereford. In the history of this breed,[2] it is mentioned that in the seventeenth century cattle had been imported into Hereford from France by Lord Scudamore, and that in later times there have been introductions of stock into Hereford from various parts of England and from Wales. Undoubtedly, however, the dominant ingredient in the improved Hereford is the aboriginal race of the county—the same race of cattle which, under different conditions of soil, climate, and management, have given us such breeds as the Devon and Sussex.

Colour.—The colour of the improved Hereford is red with white face, white marks in the top line of the neck, back over the crops as well as in the chest and bottom line, all the way backwards.

The white face has been well described as the "tribal badge" of the Hereford,

[1] Article "Shorthorn Cattle," Morton's *Cyclopædia of Agriculture.*

[2] *History of Hereford Cattle,* by Macdonald and Sinclair. Vinton & Co., Limited, London.

and we are told that this distinctive mark is traceable to the infusion of foreign blood referred to.

Many animals of the breed were at one time grey or spotted in the face, and even yet there exists a strain of Herefords known as "Smoky-faced Montgomerys."

Characteristics.—The following notes as to the characteristics of Hereford cattle are taken from the work already referred to:[1] "Hereford cattle are remarkable for the distinctiveness and uniformity of their outward characteristics and general attributes. The red curly hair, and broad kindly-looking white face, mark the trail of the Hereford wherever the breed has roamed. In former times, as we have seen, the mottle-faced and grey strains were cultivated; but all these have disappeared, and now the 'white faces' reign supreme. This distinguishing feature would seem to be indelibly stamped in the breed. . . . The almost unique permanency of the white face is the strongest possible evidence of the purity of the Hereford breed. Hereditary power is the surest sign of purity of descent; and it may be doubted if any characteristic in any of our domesticated varieties of farm live stock is more firmly fixed than the white face of the Hereford. . . .

"In conformation, the breed displays nearly as much uniformity as in colour. The most striking features in this are their broad level back, deep wide chest and brisket, hanging dewlap, light thighs, and great wealth of flesh. We have often heard strangers remark upon what some of them have designated the 'wedgy' appearance of Herefords, their great development in front, broad loins, and thin thighs. The light hind leg as well as the great development in the fore parts are heritages of the good old times when Herefords were beasts of burden, when they tilled the fields, and 'carried the harvest.' The broad back, wide rib, and wealth of flesh have been cultivated for the purpose of meat production; but the old characteristic of light thighs, though less apparent than it has been, is still a noticeable defect in many animals. The more successful of modern breeders have with good results given careful attention to the removal of this deficiency. . . .

"An important characteristic in Hereford cattle is that they carry flesh most heavily on the parts of the frame from which the best meat is cut. Their broad backs are usually loaded with meat of the very finest quality, and the average Hereford carcass is found to have its fat and lean mixed in the most admirable manner. Butchers and consumers alike hold Hereford beef in the highest esteem. Indeed, the grass-fed Hereford beef enjoys quite an enviable reputation, and brings top figures in the best markets of the country. . . .

"Hereford cattle are unsurpassed as graziers. Robust in constitution, quiet in temperament, kindly feeders, and large growers, they thrive and fatten admirably on pasture land."

Milking Properties.—Dairying has not formed a prominent feature in the agriculture of Hereford. The milking properties of its native breed of cattle have therefore been neglected. Hereford cows, as a rule, are deficient as milkers, the one special object of the breed being the production of high-class beef at an early age.

Size and Weight.—In stature as well as in height the Hereford corresponds very closely to the shorthorn. At the Smithfield Fat Stock Show in London in December 1887 the class of Hereford steers under two years old (averaging 634 days) gave an average live-weight of 1390 lb.—6 lb. less than the average of the corresponding class of shorthorns. The average live-weight of Hereford steers over two and under three years of age (averaging 938 days) was 1742 lb.; while the steers over three years (averaging 1310 days) gave an average live-weight of 2041 lb. each.

Plate 13, vol. i., represents a noted Hereford Bull.

DEVON CATTLE.

This breed has its headquarters in the counties of Devon and Somerset. There it has held undisputed sway for hundreds of years. It is the direct descendant of the aboriginal cattle of the south-west of England, and has been bred in purity for

[1] *History of Hereford Cattle*, p. 258.

centuries. In some respects, indeed, the "Rubies of the West," as these cattle are fondly designated by their admirers, occupy a position which is almost unique. Few breeds of live stock of which we have any acquaintance have so long maintained undisputed sway over their native districts as have the Devons; and there are perhaps equally few that can lay claim to as long a career of prominent usefulness. The history of the Devon breed of cattle does not cover a wide extent of country, yet it stretches far back in years, and is, locally, full of interest and edification, bound up as it is in the agricultural development of the counties of Devon and Somerset.

Early Breeders.—Arthur Young had evidently been fascinated by the Devon cattle, for he put himself to no little trouble to obtain information regarding them for incorporation in his report, dated 1776. He mentions Mr Quartly of Molland as the most celebrated of the breeders at that time in North Devon, and he gives details of an interview which he had at Molland with Mr Quartly (then spelt "Quarterly") and his brother, "the clergyman who interests himself much in live stock." Young inspected their herd, and they had the goodness "to satisfy the inquiries" he troubled them with. He thus describes the aims and objects of these noted early breeders:—

"The points they have aimed at in breeding have chiefly been to gain as great a width as possible between the hips; to have the hip-bones round and not pointed; that the space from the catch to the hips should be as long as possible; the catch full, but not square; that the tail should fall plumb, without a projection of catch and rump; to have the tail not set on high—not to rise—but be snug, and the line to be straight with the backbone—no pillow just below the cross-line from pin to pin; to be thick through the heart under the chine; that the shoulder-point be not seen—no projection of bone, but to bevel off to the neck, all elbowing out being very bad. All the bones to be as small as possible; the rib-bones round, not flat; the leg as small as possible under the knee; not an atom of the side to have any flatness. In respect to size, if other points be the same, he prefers a small cow rather than a large one for breeding a bull, because it is very rare to see any very large one handsome; but to breed oxen, a large cow. To have them sharp and thin from the throat to the nose; in the throat the cleanest have small variations from the perfect snake; though fat there, it should not bag. To be thin under the eyes and tapering to the nose, which should be white, but the original breed was yellow. Between the eyes to be rather wide; eyes themselves to be very prominent, like those of a blood-horse, and no change of colour round them. The horns to be white, with yellow tips; thin at root and long, spreading at the points. The breast or bosom should project as much as possible before the shoulder and legs; and the wider between the fore legs the better. To have the line of the neck from the horns to the withers straight with that of the backbone. The belly to be light and rather tucked up; if fat before the udder, it is a sign of a good milker."

The Quartly Herd.—Any one who knows the Devons of to-day would readily recognise in the ideal cattle thus portrayed the true progenitor of the improved breed. Intelligent breeders with so clear an ideal, so well defined a model, and the relation of all important points so well reasoned out, could not fail to leave an almost indelible stamp upon the race on which they operated. No wonder that the fame of the Quartly Devons still lives, for the efforts of Mr Quartly must have done much to mould the breed into the strongly set type which it now displays. Young tells us that the points which he describes so fully are the points which these gentlemen considered desirable to breed for in Devon cattle, which "they consider as the best in England;" and he adds, "Of their fattening qualities they observed that the Somerset graziers are the judges, who are known to prefer them. For working none can exceed them. As milkers they are represented as possessing much merit. They had two cows that gave each 17 pints at a meal, and would make in general 10½ lb. of butter per week in the flow of the season." The systematic improvement of Devon cattle as a breed began with this Mr Quartly.

He stated to Young that his father had begun breeding Devons about twenty years earlier—twenty years prior to 1776—and that he thought the breed there or elsewhere was no better then, or at any rate "two years ago," than it was when his father commenced, so little progress had there been made by any one in improving the breed. About this time, however, the demand for Devon cattle began to increase, giving a stimulus to the good work so systematically taken in hand by Mr Quartly and a few other men of "light and leading."

Down to this day the Quartly strains are held in high esteem by all the leading breeders. The value of the work done by that family is well indicated by that experienced and successful breeder, Mr W. Perry, when he says, "When I use a bull of any other blood [than Quartly], I find instead of advancing one step forward I go two steps backward."

Colour and Characteristics.—Few breeds of live stock display more striking uniformity of colour and general characteristics than Devon cattle. The South Devons—those bred in the rich valley of Taunton Dene, are larger in the frame and higher on the leg than the more plump North Devon, which is the popular type. Red is the invariable colour, varying from a dark to a shade almost as light as chestnut. The nose, which once was yellow, is now creamy white, and in summer the skin is beautifully mottled by dark spots. Some of the earlier breeders were very particular as to colour. Lord Somerville, who gave much information to Arthur Young regarding the breed, states that he considered much depended upon the colour. Those with curled hair were deemed excellent provers, and he also held in much esteem those with a very glossy mahogany skin, paler or lighter, "with curls like ripples of wind on a smooth mill-pond."

Plumpness.—The North or typical Devon is emphatically a "big little animal"—a large body upon short fine limbs—small in comparison with the shorthorn or Hereford, but weighing more than either for its height. Its symmetry is admirable, and when mature in growth and condition its body is wide, deep, and round, with a thick even padding of the very choicest of meat. "Plump as a Devon" is a frequent expression, and there is no other breed of cattle, excepting, perhaps, the Dexter variety of Kerry cattle—when these are really well fed—which represents so fully the idea of *plumpness* as does the well-fattened "Rubies of the West." It is wonderful to see the great weight of carcass which these little low-set cattle sometimes carry—who that have been in the habit of attending fat stock shows have not been struck with this? And while the legs are short and fine, the expression of the face is bright and gentle, the clear prominent eye being encircled by an orange-coloured ring. The head is comparatively small, with a broad indented forehead, tapering rapidly towards the nostrils, which are fine and clean. The horns of the female are long and spreading, with a graceful upward turn. The horns of the bull are much thicker set, and often more highly curved, than those of the cow, and in some instances they stand out nearly square, with only a slight upward inclination.

Beef Production.—As has been indicated, the Devon cattle were in former times much esteemed for working properties. In this respect they had scarcely an equal, but now cattle are worked so seldom that this quality is hardly worthy of consideration. As beef producers, however, Devon cattle enjoy quite a first-class reputation. In certain circumstances, indeed, they could hardly be excelled for this purpose. For the conversion of the hilly pastures of their native districts, no other variety of cattle has been found to equal them. It is, in fact, broadly asserted that from the consumption of the herbage of any given number of acres, Devons would produce in the aggregate as much beef as any other breed, though a greater number would be required to consume it; while at the same time there would be a greater weight of the most valuable beef, with less of the coarse joints and offal. It is well known that Devon beef, along with "prime Scotch" beef, brings the highest price in the London market; and another valuable property in the Devon is that, being small and active, it can forage well—walk over much ground for its food—

so that it is peculiarly adapted for poor pastures. The Devons have not migrated in any large numbers from their native districts, but in these they have never been successfully assailed.

Milking Properties.—Speaking generally, it could not be said that the dairy properties of Devon cattle are of a high order. The quality of the milk is of the very highest, but on an average the yield is not large, although many instances of heavy yields are on record. Vancouver, writing in 1808, mentions a cow which, although only three weeks from her time of calving, yielded in seven successive days 17½ lb. of butter, several meals of the milk during these days averaging 14 pints. In one day—and she was clean milked out the previous evening—Mr J. G. Davis's "Cherry" (5177) gave 33 pints of milk, from which 2 lb. 5 oz. of butter were made. A cow belonging to Mrs Stone, living at Catford, on Brendon Hill, often gave 2½ lb. of butter per day, and it is recorded that this cow milked till nearly twenty years old, was then fattened slowly on grass alone, and slaughtered, when her dressed carcass weighed 800 lb.

Weights.—The weights which Devon cattle attain when fattened are small compared with those credited to our larger breeds, but, as already indicated, they are great for the apparent size of the cattle, while the percentage of dead meat to live-weight is exceptionally high, and the amount of cheap meat relatively small. Occasional animals of the breed have reached as much as 19 cwt. live-weight at four years old, but the average is much below that. At the Smithfield Fat Stock Show at London in December 1887, the class of two years old Devon steers (averaging 681 days) gave an average live-weight of 1235 lb.; steers over two and under three years old (averaging 996 days) 1489 lb.; and steers over three years (averaging 1320 days) 1734 lb. each.

Plate 14, vol. ii., represents a noted modern Devon Bull.

SUSSEX CATTLE.

Mr Henry Evershed contributes the following notes on this breed:—

Speaking of the old breed of Sussex cattle as they were in the last century, Mr Alfred Heasman, editor of the *Sussex Herd-Book*, and author of an account of Sussex cattle in Coleman's *Cattle, Sheep, and Pigs of Great Britain*, mentions the custom of the farmers of West Sussex attending the fairs at Lewes and Battle in order to buy up the aged working oxen, which weighed when fat a year later from 180 to 200 stone. This was certainly a grand breed on which to found a modern meat-producing type. Mr Ellman of Glynde, the great improver of Sussex sheep, found the Sussex ox a long-legged, strong-boned, coarse, but useful beast of burden; and after breeding and exhibiting the native cattle with great success for many years, and encouraging others to do so, he left them much improved. Still they were an old-fashioned sort. Their colour was either light or dark red. The type was greatly improved during the Ellman period, and in spite of the decay of the breed which we read of in the prize report on Sussex farming in the *Journal of the Royal Agricultural Society of England*, 1850, several farmers in the county, predecessors in some cases of the breeders and prize-winners of the present day, still retained good herds.

Coming down to more recent times, we find the breed taking high honours at the Smithfield Club shows. The first volume of the *Sussex Herd-Book* was published in 1879, but unfortunately it contains no introductory chapter showing the exact steps which have been taken in forming the present improved race. It is now so well understood that in the case of most improved breeds of cattle and sheep judicious crossing has preceded selection, that Sussex breeders would most probably be willing to admit the depth of their repeated dips into the Devon blood. The Royal Society first gave separate prizes for Sussex cattle at Leeds in 1861.

At the Paris exhibition of 1859 the Sussex and Devon breeds were conjoined in competition, though it was agreed that they differed sufficiently to make such mixing undesirable. They ran neck and neck, however, the Devons winning in the class for bulls under two years old, and the Sussex in the old bull class. At

Kilburn, in the same year, the persevering exhibitors of this hardy, beef-making breed were highly complimented on their position, since their cattle, as stated by the reporters in the *Journal of the Royal Agricultural Society of England*, "formed one of the main features of a generally splendid exhibition of the bovine race." It was admitted by the reporters that the Sussex steers would, at two years of age, be as heavy as the Devons at two years and six months, though the comparative weight of the animals by no means decides the question of their comparative profit. Passing on to the year 1881, when Sussex cattle had already risen high in public favour, the reporter of the live stock at Derby, in the *Journal of the Royal Agricultural Society of England*, assists us in carrying on their history. "No breed," he wrote, "has been so improved as the Sussex during the past thirty years. . . . Their form has been levelled up to fair and comely proportions, and their touch mellowed by happy selection; and it is acknowledged that in respect of early maturity, as evidenced at the shows of the Smithfield Club, they are fast approaching to the standard of shorthorns. Kentish and Sussex butchers prefer well-bred Sussex bullocks to any others."

In the report of the judges after the Reading show in the following year, we find an acknowledgment of the merits of a breed of cattle which had now become the observed of all observers, although a few years previously breeders of Herefords, shorthorns, and Devons had passed them by with a shrug of the shoulder. As the origin of a breed is always a matter of interest and importance, we may mention that the experts just referred to spoke of them as big Devon-like beasts; but they described them as having more size and a deeper colour, as being higher on the leg, and possessing less finish, less elegance, but a more robust appearance; adding to this description, "they give one quite the idea of being of Devonshire extraction." The same experts assigned to those enterprising tenant-farmers, to whose successful enthusiasm the improvement of the breed was solely due, the full credit of having established a class of animals of great uniformity of character, which had lost the unlevel outline that once distinguished them, and which retained immense length, with a carcass good enough for the most fastidious West End butcher. The cows are not behind the bulls in massive frames of well-balanced meat, surpassing in this respect all other breeds. It could not be expected that such a conformation of the females would be accompanied by good milking qualities, and as dairy stock it must be admitted that the Sussex breed is defective.

As the showyard representatives of the breed have for some years past been very numerous compared with the total number of Sussex cattle, they must have stamped their character on the stock at large in a very marked degree, and for this reason we have brought forward what may be styled official evidence of the "vast progress" of the prize-winners at the Royal exhibitions and the Smithfield Club shows. So able and impartial a reporter as Mr William Macdonald, late editor of the *North British Agriculturist*, said of them, after the York show of 1883, that with something like the scale and outline of the shorthorn, they approached the Devon in uniformity and quality of flesh. They are, said this authority, "grand beef-producing cattle, and deserve a wider hold than they yet possess of this meat-raising country." In regard to early maturity, Mr Macdonald remarks of a victorious yearling heifer, "Few animals of any breed, at the age, would scale with her, and withal she is symmetrical."

The least important characteristic of a breed of cattle probably is colour, but we must nevertheless state that instead of the lighter or darker red, which are now fashionable with Devon breeders, an intermediate or cherry colour is preferred by the fanciers of the Sussex cattle, indicating, they think, good flesh, good quality, and aptitude for fattening. It happens that the writer has recently inspected some of the best herds of Devon and Sussex cattle, and it seems to him that the remarks of Captain Davy, late editor of the *Devon Herd-Book*, on the superior beauty of his favourite breed, though made as long ago as 1863, are still applicable. The

Sussex cattle are now, as they were then, less pleasing in appearance, coarser in bone, with comparatively upright shoulders and less perfect form. The remarks of Captain Davy being quite dispassionate, may be quoted as follows: "It is not difficult to observe that the Devonshire and Sussex races are of the same extraction; indeed so nearly do they resemble each other in colour and length of horn that, if a stranger to the breeds were shown two animals, one a Devon, the other a Sussex, I doubt if he would observe any material difference between them, except that the Sussex beast might appear rather the larger, or, as the Swiss would say, the *taller* breed, from the greater length of the leg; but the more experienced observer would discover in him a larger and less finely chiselled head, coarser eyelids, combined with a less pleasing expression of the eye, and a crescent-shaped upward horn, instead of the deer-like head and gracefully curved yellow-coloured horn of the Devon."

The hardiness of the Sussex breed is acknowledged, but in this respect it is not perhaps superior to the Devons, which in their own county, in a humid climate, are frequently wintered out of doors from an early age, running at will in the more sheltered of the pastures, with open sheds for their only lair. The following merits of the breed, set forth by an excellent authority, cannot be disputed: "The Sussex cross well with any breed; by using the male, animal substance and firmness of flesh are imported, and the colour of the offspring is generally red. They are of themselves a hardy breed, and have been found to surpass all others in the poorest pastures of their native county." He adds, "The cows are not good milkers; those with the heaviest flesh are the worst, but produce sufficient to rear their calf." Then follows a good hint in regard to management: "The most successful way of breeding is to calve them down in October and November, let them have their own calf through the winter, which can be weaned in the spring and another calf put to the cow. If managed in this way, each cow will rear two calves, and the number of barreners be greatly diminished;" and barreners are sure to follow when cows are allowed to drop their calves all the year round.

Among their other good qualities, the uniform character of the breed is strongly transmitted to the progeny of Sussex bulls, when they are crossed with other cattle. It is no slight merit that they can clear up the roughest pasturage, bear hardships, and walk any distance without suffering.

Before concluding this brief account of a breed of cattle which is even now far too little known, it will be well to describe, as a typical animal, a bull bred by Messrs Stanford, and acknowledged to be the best Sussex bull ever shown. This is "Goldsmith," thus described in the report of the live-stock York show, 1883 (*Journal of Royal Agricultural Society of England*): "With a brisket well down to the ground, this ponderous bull is no more noteworthy in respect of size, width, and length, than for levelness and accumulation of flesh. He is astonishingly coated, and retains his bloom wonderfully." The present owner of "Goldsmith" is Mr W. S. Forster of Gore Court, Maidstone, in whose boxes the writer has seen "Goldsmith," still (1891) blooming in his twelfth year, with his grandson "Mikado," which has been little if at all less successful in the showyard than himself.

Mr Forster is now one of the most distinguished breeders of Sussex cattle, standing on a level in the great showyard struggles with the Stanfords and Agates, and others among the older exhibitors. He owns a herd of ninety-two, and there can hardly be a more interesting pastoral scene than the herd in the grass fields round his house on a fine day in summer, when the glossy rich coats of the animals shine in the sun. Mr Forster has found that in pastures of moderate quality Sussex cattle do better than any other kind. They are very large in frame, hardy and robust in constitution, and, as a rule, very gentle and tractable. His heifers are sent to the bull at two years old, and the progeny run with their mothers in the pastures till they are six or seven months old. The hardihood of the breed is maintained by the treatment of those animals which are not in training for the shows, the cows (when their calves are weaned), as well as the two-year-old

heifers in calf, running out alike in summer and winter, day and night, having, however, a yard and sheds where they can find shelter at will. The cows, with calves by their side, also run out summer and winter, unless the weather is very severe, but the calves are taken in at night in winter. The yearling steers and heifers are wintered in yards, and fed on straw and roots and a little cake, so as to bring them on steadily.

It should be added that the butchers of Kent and Sussex prefer the Sussex bullocks to any others; and this is not a mere prejudice, for amongst a large number of prize beasts of the Smithfield show of 1888, a Sussex bullock came out best in the proportion of dressed carcass to live-weight. This bullock was a steer a few days less than three years old. Its dressed carcass weighed 1422 lb., and the percentage of dressed carcass to gross live-weight was 71.67.

An improved Sussex Cow is represented in Plate 16, vol. ii.

NORFOLK AND SUFFOLK RED POLLED CATTLE.

Amongst the native cattle of England the Norfolk and Suffolk Red Polled breed stands highest for dairying purposes. The Red Polls are handsome symmetrical animals of medium size.

Origin.—They bear a close resemblance to the polled cattle of Scotland, and from the fact that in former times Scotch cattle were in large numbers transported for fattening in Norfolk, it is assumed that this likeness in form arises in some part from kinship in blood. Be this as it may, however, the Red Polled breed can be traced as a distinct and well-defined variety far back into the eighteenth century. In his *Review of Norfolk*, published in 1782, Marshall states that the native cattle of the county were "a small hardy thriving race, fattening as freely at 3 years old as cattle in general do at 4 or 5. They are small-boned, short-legged, round-barrelled, well-loined, the favourite colour a blood-red, with a white and mottled face."

Writing twelve years later, Arthur Young says, the Suffolk breed of cattle "is universally polled—that is, without horns; the size small, few rise when fattened to above 50 stone (14 lb.); the milk-veins remarkably large; cows upon good land give a great quantity of rich milk."

From these useful native cattle the improved Red Polls have been built up, entirely, it may be said, by selection in breeding and by judicious treatment.

Characteristics.—The improved Red Polls are considerably larger than their progenitors were at the beginning of the nineteenth century. They are still uniformly red in colour, but without the mottled face spoken of by Marshall. They are good beef producers, and, as has already been indicated, are possessed of excellent dairy properties. Indeed, it is with good reason contended that there is no other variety of cattle in the British Isles which in so high a degree combines fattening and dairy properties.

No doubt, Shorthorn cows will be found to exceed Red Polled cows in the yield of milk; but, taken as a whole, the latter are superior to the rank and file of Shorthorn cows. The Red Polls, moreover, are hardy docile cattle, mature at a moderately early age, and are on the whole an eminently thrifty and profitable class of cattle.

Yield of Milk.—Mr Thomas Fulcher, one of the most successful breeders of Red Polls, states "that many good cows yield from 45 to 50 lb. of milk per day for five months after calving, and they have not that tendency to go dry which belongs to the Alderney, Ayrshire, and the Shorthorn. It not unfrequently happens that a cow will continue to give milk from one calving to another." The Red Polled cattle have been exported in considerable numbers to foreign countries.

A modern Red Polled Bull is represented in Plate 15, vol. ii.

LONG-HORNED CATTLE.

This ancient and characteristic breed of cattle would seem to be approaching extinction. It was the first breed upon which Bakewell, the great pioneer breeder of farm live stock, began his experiments in the improving of cattle. These experiments were begun as early as 1755, and from that year dates the breeding of farm live stock upon scientific principles.

The Long-horned cattle at one time existed in large numbers throughout England, chiefly in the Midland counties. They were also introduced into Ireland, but long ago they have been supplanted at one point after another by the Shorthorns or some other variety, and now the last few remnants of the breed are to be found in the Midlands of England.

The Long-horns are big, long, rather ungainly cattle, with long drooping horns, which are often so shaped as to make it difficult for the animals to graze short pasture. The cows are fair milkers, and the bullocks attain great weight. In the general properties of rent-paying stock, however, they are surpassed by most other improved breeds; and although we look upon them with a kindly historic interest, it must now be reluctantly admitted that there is little reason for their continued existence.

POLLED ABERDEEN-ANGUS CATTLE.

Amongst the polled varieties of cattle, the Aberdeen-Angus breed is by common consent allowed the first position. No race of British farm live stock has made more progress since the middle of the nineteenth century than this famous race of beef-producing cattle. At the great International Exhibition at Paris in 1878, the late Mr William M'Combie of Tillyfour carried off the champion prize for the best group of meat-producing cattle. His victorious group consisted of five black polls, all of his own breeding; and when it is remembered that no fewer than sixty different varieties of cattle—including the best of the English breeds—were represented in that memorable contest, it will be understood that the triumph gained by Mr M'Combie and his favourite polls was one of no ordinary importance. That great victory has been followed up by repeated successes at the annual fat stock shows at Birmingham and London—representatives of the breed having won the £100 Champion Plate at the London Christmas Fat Stock shows in 1881, 1885, and 1887. These great achievements, backed up as they have been by the undeniably high character of the Northern polls as beef-producing animals, have won for the breed high esteem, not only throughout the British Isles, but also in many foreign lands. The breed is as much thought of abroad as in its native regions in the north-east of Scotland. It is gradually extending into England and Ireland, and has been exported in large numbers to foreign countries, chiefly to the United States and Canada.

Origin. — It is established beyond doubt that the improved Aberdeen-Angus cattle are the direct descendants of the ancient polled cattle of "Angus" and "Buchan," two varieties of cattle of the same type known in the former district as "Doddies," and in the latter as "Humlies." The history of this breed has been traced fully in a volume published in 1882; and those who are interested either in the descent of this particular breed, or of polled cattle generally, may be referred to that work.[1]

Early Improvement. — It is stated in that volume that there is good reason to believe that both in Aberdeen and in Angus the systematic efforts to improve the breed had begun some time before the advent of the present century. In Angus, the first improver was the late Mr Hugh Watson, farmer, Keillor, Meigle. In Aberdeenshire, the work which was so well begun by Mr Watson was taken up heartily and methodically, and with great advantage to the interests of the breed, by the late Mr Wm. M'Combie of Tillyfour, who has been justly described as the "great deliverer" of the polled race—a distinction which he earned by the fact that when the fast-spreading popularity of the Shorthorn threatened the extermination of local breeds, Mr M'Combie came to the rescue of his favoured race of Aberdeen polls, holding to them against all comers, and as we have already seen, carrying them through to world-wide renown.

Characteristics.—From the work on the history of the breed already referred to we take the following extracts as to the attributes of the improved polled Aberdeen-Angus cattle:—

"In general form a model polled animal differs considerably from a model shorthorn. Both should be lengthy,

[1] *History of Polled Aberdeen or Angus Cattle.* By James Macdonald and James Sinclair. W. Blackwood & Sons.

deep, wide, even, proportionate, and cylindrical. The polled animal, however, should be more truly cylindrical in the body than the shorthorn. Its points should be more quickly rounded off; or, in other words, the frame of the polled animal is not so fully drawn out to the square as that of the shorthorn. Critics have pointed out in some of the best polled animals now or recently living, a tendency to approach too nearly to the square type of the shorthorn. In a beef-producing animal, a broad square frame can hardly be said to be a blemish; for if it is thoroughly well covered all over, it will carry more beef than a rounder frame. A compact well-rounded frame, however, has always been a leading characteristic of the polled breed; and the main reason why a square shorthorn-looking frame is objected to in a polled animal is, that such a form is foreign to the breed, and therefore apt to arouse suspicions of impurity. The admirers of the breed claim for it valuable natural properties not found to an equal extent in any other breed; and they fear that should the breed lose its characteristically natural appearance, it may also lose its superiority in those valuable properties — 'the genuine article should always bear its trade-mark.' Careful improvers of the breed are specially particular as to the hind quarters. While they aim at developing long, level, thick, deep quarters, they also strive to retain the rounded appearance which was originally one of the dominant characteristics of the breed.

"The head of the polled male should not be large, but should be handsome and neatly set on. The muzzle should be fine; the nostrils wide; the distance from the nostrils to the eyes of only moderate length; the eyes mild, large, and expressive; the poll high; the ears of fair size, lively, and well covered with hair; the throat clean, with no development of skin and flesh beneath the jaws, which should not be heavy; the neck pretty long, clean, and rising from the head to the shoulder-top, and surmounted by a moderate 'crest,' which contributes to masculine appearance — a desirable point in a bull. The neck should pass neatly and evenly into the body, with full neck-vein. The shoulder-blades should lie well backwards, fitting neatly *into* the body, and not lying awkwardly *outside* it: they should show no undue prominence on the shoulder-top, on the points, or at the elbow. An upright shoulder in cattle is generally accompanied by a light waist—an important, and in all breeds a much too common, defect. The chest should be wide and deep, so as to give plenty of room for lung-development. The bosom should stand well forward between the fore-legs, and underneath should be well covered with flesh and fat. The crops should be full and level, with no falling off behind them; the ribs well sprung, springing out barrel-like, and neatly joined to the crops and loins; the back level and broad; the loins broad and strong; the hook-bones not too wide—narrower than in an average shorthorn; the quarters long, even, and rounded, with no hollow from the hooks to the tail; the tail should come neatly out of the body, not too far up the back, and not higher at the root than the line of the back. A high tail-head was to some extent characteristic of the ancient polled breed, but it is one of the defects that are being gradually removed by the more scientific systems of breeding now pursued.

"Some good polled cattle, too, have been found to show a development of soft worthless flesh and fat on the rounds behind; but that defect, which is disliked very much, is also almost obliterated. The tail should hang straight down, close to the body all the way till it comes near to the level of the flank. On both sides of the tail the quarters should turn away in a rounded manner, swelling out downwards, and ultimately passing into thick deep thighs. The twist should be full, and the hind legs set well apart, and not detached from the body until the level of the flank is reached. The flank should be full and soft, so that a good handful may be got out of it. The bottom line should be as even as the top and side lines; and the bones of the legs fine, flat, and clean, with plenty of muscle and flesh above the knees on the fore legs. The body should stand neatly and gracefully on the legs; and when the animal is stationary, the fore legs should be perfectly

straight, and the hind legs very slightly bent forwards below the hock. All over the frame there should be a rich and even coating of flesh. Even the hook-bones, and other prominent parts, should be well covered; and above all, there should be no patchiness — no hollows, and no rolls of hard flesh, with spaces of soft useless fat between them, such as are always found in a patchy animal. Except in rare cases, the skin is fairly thick, but soft and pliable: it ought to be so free over the ribs as that one could fill one's hand of it. The hair is, as a rule, not long, but fairly thick and soft; and in the best animals shows two growths, or rather two lengths — one short and thick, and the other longer and thinner. When walking, a good animal of the breed presents a very compact, graceful, and symmetrical appearance. Indeed it is fairly enough claimed for the breed that in these and in some other respects it has hardly any equals, and no superiors. The above description refers more correctly to bulls than to cows. The latter, of course, differ considerably in character. The head is much finer, the neck thinner and cleaner, with no crest; the shoulder-top sharper; the bone altogether finer; the skin not quite so thick; the udder large, and milk-vessels large and well defined.

"In appearance, as well as in other characteristics, the polled Aberdeen or Angus breed differs substantially from the polled Galloway race. The former has lived under a dry cold climate, and has been fed in the house during a large part of the year. The latter has its home in a moist climate, and has spent much more of its time in the open fields. The differences between the two are just such as might be expected from their different conditions of life. The Galloway, as already noted, has a thicker skin and stronger coat of hair, and has altogether a slightly more shaggy appearance than the northern polled cattle, and does not mature quite so quickly.

"It is claimed that the northern poll surpass all other races of cattle in the production of beef. On that point there is, of course, considerable difference of opinion; for at the present day, when the beef-producing properties of our other leading breeds, notably the shorthorn and Hereford, have been developed to so high a degree, it could not be expected that with anything like unanimity any one breed would be accorded the premier position. Be that as it may, we think the polled Aberdeen or Angus breed may safely be said to be inferior to none as all-round beef cattle, and superior to all others in some respects. The brilliant and unequalled position it has latterly taken, alike in the show-yard and market-place, sufficiently establishes its claim to that description. Its show-yard achievements will be fully noticed afterwards. Here it may be noted, that at the Paris Exhibition in 1878 it carried off every single honour for which it was entitled to compete, including the £100 prize for the best group of beef-producing cattle in the Exhibition; and that in British show-yards, both fat stock and breeding, it has attained to a leading position. In a strictly butcher's point of view, it has very seldom to yield to any other race of cattle.

"The superiority over most other breeds, for the butcher's purpose, lies mainly in the excellent quality of beef, and in the high percentage of dead-meat to live-weight. As a rule, the beef of the northern polls is very well mixed, and contains a greater proportion of compact, finely grained flesh, and less soft, coarse fat, than most other kinds of beef. Inside, the carcass is usually well lined with fat of the finest quality; while in the density and quality of the carcass itself, the breed may fairly enough claim the premier position among all our leading breeds of cattle. Some place the small Devon breed alongside, if not even before it, in this respect; but with that exception, we do not think that any other breed in the British Isles will on an average yield so high a percentage of dead-meat to live-weight. In butcher's phraseology, it 'dies' well and 'cuts up' admirably. In all the leading fat-stock markets in the country the breed is held in high estimation, and, as a rule, commands the very highest prices—in fact, generally a higher price in comparison to its size and live-weight than any of the other leading breeds. This is especially the case at the great Smithfield Christmas Market in London, where the plump compact polls from the north never fail

to find a ready sale at the highest quotations."

In the direction of early maturity this breed has in recent years made marked progress. At several of the large recent Fat Stock shows it has surpassed all other breeds in this respect. At the London Christmas Fat Stock show in December 1887 the class of polled Aberdeen steers two years old (averaging 667 days in age) gave an average live-weight of 1475 lb., while steers over two years and under three years (averaging 984 days) gave an average live-weight of 1874 lb.

Colour.—Black is the all-prevailing colour of the Aberdeen-Angus cattle. Formerly red was by no means uncommon. Occasionally a red calf is still dropped, but it is an unwelcome visitor, and is seldom allowed to "stay."

Plate 17, vol. ii., represents a noted Polled Aberdeen-Angus Bull.

GALLOWAY CATTLE.

This hardy and picturesque breed of black polled cattle takes its name from the south-west of Scotland. There it is believed it has existed for centuries, coming down to us with a long line of pure descent.

Origin.—The origin of the Galloway cattle is lost in the mists of antiquity. Yet enough is known to justify its claim to rank as one of the oldest and most distinguished of the British breeds of live stock. They are referred to by several writers as having exhibited great excellence as grazing cattle about the beginning of the nineteenth century.

As to the more recent progress of the breed, the Rev. John Gillespie, writing in 1886, says: "The improvement made in the breed during the last sixty years has been very great. This is an era within the memory of living men, and there has never been the slightest shadow of a doubt cast upon the fact that it has been brought about by the identical means employed last century—viz., by systematic and skilful mating of the best specimens of both sexes, and also by attention to diet and general management. To the early improvement of the Galloways, and to the further fact that no blood has at any period of their history been infused into the breed from any outside quarter whatever, must no doubt be traced one of its most marked and valuable characteristics—viz., the extraordinary impressiveness of the breed."

Characteristics of the Galloway.—Galloways are black and hornless like the polled Aberdeen Angus cattle. From the latter they differ substantially, however, not merely in outward features, but also in their inherent characteristics. The two breeds are similar in size; the Galloway is the more shaggy and muscular in appearance, has a thicker hide and a ranker coat of hair, and is perhaps on the whole the hardier of the two. Aberdeen-Angus cattle, however, have a decided advantage in regard to early maturity, and to their adaptability for house-feeding.

For grazing the Galloways are especially renowned, and for this purpose they have long been eagerly sought after both in England and Scotland, while in later years they have gained considerable popularity in the ranches of the Western States of America.

Milking Properties.—Galloway cows, as a rule, are below the average in the production of milk.

The dairy properties of the breed have never been systematically cultivated, and many of the cows give a very small quantity of milk. As a rule, however, the milk is exceptionally rich in quality.

Plate 18, vol. ii., represents an improved Galloway Bull.

AYRSHIRE CATTLE.

Of all the native British breeds of cattle, the Ayrshire is the most valuable, judged exclusively from the dairy farmer's point of view. The production of milk is the one special function of the Ayrshire, and this it fulfils in so admirable a manner as to have earned the highest estimation of dairy farmers. Although it has its headquarters in the county whose name it bears, the breed is now widely diffused throughout the south-west of Scotland, while it has spread into England and Ireland, as well as into many foreign countries.

Origin.—There is much uncertainty as to the origin of the Ayrshire breed.

The most generally accepted idea is that its progenitors were of Dutch extraction. It has been located in the south-west of Scotland for a very long period of time, and has been there bred in its purity with the greatest success. There is abundance of evidence to show that it had established its name as a distinguished dairy breed of cattle in the south-west of Scotland before the close of the eighteenth century.

Characteristics.—The prevailing colours of the Ayrshire are brown and white, each colour being distinctly defined. Some, however, are almost entirely white, while others are almost wholly brown. Ayrshires are wide, low-set cattle, with long horns curving upwards. Their beef-producing properties are not of a high order, and if it were improved in this respect without materially deteriorating its milking properties, the popularity of the Ayrshire throughout the country would be vastly increased.

Writing of Ayrshire cows, Professor Primrose M'Connell says: "They will cost £15 per head to lay in; will cost £15 per annum to feed; will yield about £20 of produce, which will be over 600 gallons of milk per annum, showing 3.5 to 4 per cent of fats, 12 to 15 per cent of cream, 12½ per cent of solids, and 200 lb. of butter per annum; and she will sell when fat at £12 to £15. Her hardiness will enable her to live and to thrive in exposed situations and on scanty fare; while when taken south, if she gets plenty of good water to drink, and is not pampered with too much good food, she will do better, and will repay the outlay and trouble."[1]

Mr William Bartlemore gives the following description of a typical Ayrshire cow: "The Ayrshire cow of the present day is a fully medium-sized beast, with wide upstanding clear horns and body somewhat wedge-shaped. What breeders have universally aimed at in order to ensure the highest milking qualities was to produce an animal with a body light before, and heavy behind, with capacious udder. The leading characteristics of a desired specimen are a nice clean short head, full lively eyes, clean long neck, broad but clean chest, well-developed spine at the shoulders, straight back, wide hook-bones placed the same distance from outline of tail as from the fore rib; the ribs well sprung and gradually deepening backwards, hind quarters long, broad, and straight; soft elastic skin, with the whole body set on short legs, and exhibiting throughout fineness of bone. The teats should be well set, of moderate length and thickness, and the milk-vessel not fleshy, but large and capacious, well up to the escutcheon behind, level with the belly, and the milk-veins on the abdomen showing largeness and superior development. The animal should be a free, jaunty mover, exhibiting style and grace in her actions."

A noted modern Ayrshire Cow is illustrated in Plate 19, vol. ii.

[1] *Live Stock General Almanac*, 1886, p. 112.

WEST HIGHLAND CATTLE.

This singularly handsome breed, often spoken of as the "Kyloe," has its headquarters on the high-lying farms of the counties of Argyll, Perth, and Inverness. Amongst all the many varieties of British cattle there is none more handsome than the typical West Highlander. It is quite as handsome in form as the improved Shorthorn, is almost as large in size, and with its rank, shaggy coat of hair, long, spreading, gracefully turned horns, hardy muscular appearance and defiant gait, throws all other varieties of cattle into the shade in picturesqueness and beauty.

Origin.—The prevailing idea as to the origin of West Highland cattle is that they are descended, and that in a direct unadulterated line, from the ancient native cattle of the districts still regarded as the home of the breed. It is generally considered that the Wild White Cattle of Chillingham, the Wild Cattle in Hamilton Park, the useful little Kerry of Ireland, and the West Highland cattle of Scotland, are the purest representatives of the ancient cattle of the British Isles.

Characteristics.—The West Highland breed exhibits considerable variety in size, form and colour. The strains which are reared in the South-Western Highlands are much larger than those which have their home in the higher and bleaker mountain-ranges of the northern counties. The former are also the more

handsome, and in all respects the more profitable class of cattle. The prevailing colour is dun or yellow, of various shades, but many of the animals are black or brindled, and a few are dark red.

The West Highlanders are slow in growth, and equally slow in taking on flesh and fat. When fully matured for the butcher, however, they sell readily, and bring a high price per cwt. Their beef is well mixed, choicely flavoured, and is in high repute amongst the best class of butchers. Like all other breeds, they have in recent years made some progress in the matter of early maturity. As a rule, however, they are not fully matured until four years old.

The West Highland is the hardiest breed of cattle known to exist. They live and thrive on exposed heather and hilly ranges on which no other variety of cattle could maintain an existence.

For Highland districts, therefore, the breed possesses a special value, while they are also in request for stocking gentlemen's parks, where, as might be expected, their picturesque appearance is highly appreciated.

In his work on domestic animals, Low gives the following description of a typical West Highlander: "The neck should be strong and muscular, the forehead rather broad, and the nose from the eyes to the muscle somewhat short; a dewlap should exist as a character of the breed; the eyes should be prominent and clear, the horns should be of a good length without approaching to coarseness, spreading and tipped with black. . . . Their limbs are short, though muscular; their chests wide and deep, their ribs well arched, and their backs as straight as in any other breed. The neck, indeed, and dewlap, seem somewhat coarse in the bull; but these are characteristics indicative of their mountain state, and almost all their other points are what breeders would term good."

Plate 20, vol. ii., represents a modern West Highland Cow and Calf.

KERRY CATTLE.

As has been already indicated, Ireland claims only one pure breed of cattle—namely, that which takes its designation from the rugged mountains of Kerry.

Origin.—It is generally acknowledged that nowhere in the British Isles is there a purer representation of the smaller varieties of the aboriginal cattle of Northern Europe than is provided in the Kerry cattle of Ireland. They are the smallest of the many varieties of British cattle, and none possess more distinctive features or more certain marks of purity of descent. Their individuality is indeed very striking, and although small in size and slow in maturing, they are most useful cattle in their own proper sphere. The breed has its headquarters in the bleak steep hills of county Kerry, where it has had to subsist upon scanty fare, exposed to wind and rain, with little artificial shelter or attention of any kind. This untoward treatment has of course told its inevitable tale. It has cramped the stature of the cattle, and made them slow in maturing; but it has also endowed them with a sound constitution and exceptional hardiness, as well as the rare and useful faculty of existing and feeling happy on small fare. Proverbially, Irishmen make the best of emigrants. A similar property can be claimed for the Irish national breed of cattle; for the little Kerry "adapts itself readily and agreeably to change of scene, and seems as much at ease in the wooded parks of England as on the rocky heights of its Irish home." By degrees Kerry cattle are making their way into England, where they are found specially useful on poor land and in small family dairies.

The Typical Kerry.—In outward form Kerry cattle are somewhat similar to the cattle of Brittany, fully as high, but rather more slender and deer-like. The Kerry is active and graceful, long and light in the limb, head small and fine, throat and neck slight and clean, eyes prominent and keen, horns turned upwards, and white with black tip; shoulders thin and sloping, and sharp on the top; chest fairly wide, back straight, but rather narrow; ribs fairly well sprung, barrel not deep, hooks wide, quarters long but often uneven; tail-head sometimes rather high, tail slight and long, thighs thin; udder large in size and well shaped, being full behind and carried well forward; milk-veins full and well defined, skin moderately thick and mellow, colour

usually black, but some have white spots underneath, and now and again a red Kerry is seen. The bull is thick, straight, fine in the skin, with good masculine head and neck. Many of the animals have curiously "cocked" horns, first projecting forwards and then taking a peculiar turn backwards—caused, says an Irish wag, by the strong winds the cattle have to face in mounting the Kerry hills!

The Dexter.—The animal just described is the typical Kerry. The "Dexter," a distinct branch of the same breed, is an animal of a very different type—much shorter in the leg, thick and plump in the body; indeed, in all respects, excepting that of size, an admirable sample of a beef-producing animal. If less elegant and "milky" looking than the typical Kerry, the Dexter is decidedly more symmetrical; and if increased in size, as by selection in breeding and liberal treatment it might soon be, it would be found to be a very profitable class of stock, very hardy and docile, easily fattened, and producing beef of the very choicest quality.

The origin of the Dexter variety, so distinct from the parent stem, is somewhat uncertain. The prevailing impression is that it resulted from a cross introduced upon the Kerry, bred by a gentleman of the name of Dexter between 1830 and 1840; but there is no actual record of this, and no information vouchsafed as to what breed had been resorted to for the cross. Others believe and contend that Mr Dexter established his favourite variety entirely by selection in breeding. Be this as it may, it is certain that he succeeded in stamping the Dexter type very firmly upon the cattle, for there is now as much fixity of type and character in the Dexter variety as in the true Kerry itself.

Characteristics.—Irish farmers have paid little attention to the Kerry breed, and thus have neglected their own interests. The breed certainly possess characteristics which, with careful cultivation, would earn for them an excellent reputation as rent-paying stock. They are specially adapted for high cold situations where food is not too plentiful. As dairy cattle they have gained a good name. Indeed it may be doubted whether we have any breed of cattle in this country which will beat the Kerry in the return in milk and butter from a given quantity of food. Youatt gave the Kerry cow a high character, and yet he was well justified in what he said: "Truly the poor man's cow, living everywhere, hardy, yielding for her size abundance of milk of a good quality, and fattening rapidly when required."

An increasing demand for exportation and neglect of the breed at home seemed to endanger its existence. Just in time, however, a movement has taken shape for the cultivation and improvement of the breed. A herd-book has been established, and the interests of the breed are at last being well looked after.

Mr Robertson's Herd.—For many years Mr James Robertson, La Mancha, Malahide, Co. Dublin, was the most successful exhibitor of both Kerries and Dexters, and his valuable herd has supplied breeding stock to many admirers of the breed in England as well as in foreign countries.

An average Kerry cow under favourable conditions will yield from 12 to 13 quarts of milk daily, and very little over 10 quarts of milk will give one pound of butter. Mr Robertson's famous prize cow "Rosemary," afterwards the property of Mr Martin J. Sutton, of Kidmore Grange, Reading, was one of the most handsome Dexters we have ever seen. Her height at the shoulder was only 3 feet 4 inches, and yet behind the shoulders she girthed 5 feet 7 inches, her length from the shoulder-top to the tail-head being 3 feet 9 inches; and what is more remarkable still, her udder when in full milk girthed no less than 34 inches.

Live-weights.—Mr Pierce Mahony, of Kilmorna, has made efforts to increase the size of the Kerry cattle, and the following figures giving the live-weights of a few of his animals will show that he has made some progress: Bull, 2 years 8 months and 2 weeks old, 8 cwt. 1 qr.; bull, 15 months old, 5 cwt. 2 qrs. 7 lb.; bull, 12 months old, 4 cwt. 1 qr. 15 lb.; bull, 8½ months old, 4 cwt. 2 qrs.; cow, aged 4 years, 6 cwt. 2 qrs. 7 lb.; heifer, 2 years and 2 months old, 6 cwt. 21 lb.; heifer, 14 months old, 4 cwt. Kerry cattle fatten readily on moderately good treatment, and they are well liked by

butchers, who can readily dispose of their handy little cuts of sweet wholesome meat.

A Family Cow.—The Kerry or Dexter cow is admirably adapted for the villa dairy—for those who have only a small plot of grass, and yet would wish to indulge in the unspeakable delights of a cow of their own. The hardy and docile Kerry will thrive well in the house or on the lawn, and will give a bountiful return of delicious cream and butter.

In England Kerries are making their way in the family dairy. There are now several large herds of Kerries and Dexters in England, one of the largest and most select being that which Mr Martin John Sutton has established at Kidmore Grange, Reading. Mr Sutton drew principally from the La Mancha herd, and his stock have thriven so well with him that it is doubtful if even in Ireland itself there is a herd of higher average merit. Mr Sutton's fancy leans to the Dexter, and he has bred some excellent representatives of this variety.

Plate 21, vol. ii., represents improved Kerry and Dexter-Kerry Cows.

WELSH CATTLE.

In the principality of Wales several varieties of cattle have existed from time immemorial, all of them derived from the aboriginal cattle of the country. At least four varieties are generally spoken of—namely, the Pembroke, Glamorgan, Anglesea, and the Merioneth cattle.

The first-named has generally been regarded as the best. Although these varieties present considerable diversity of type and character, there is all through them a noticeable family likeness, supporting the belief in their common origin.

Characteristics.—The Welsh cattle are generally black in colour, with long horns, hardy in constitution, slow in maturing, but able to subsist and thrive upon scanty fare. Many of the cows are excellent milkers. In recent years the best of the varieties have been greatly improved, especially in their fattening properties.

The larger strains attain great weight when from three to four years old. At the London Christmas Fat Stock Show in 1887 the class of Welsh steers gave an average live-weight of 2111 lb., their average age having been 1286 days.

SHETLAND CATTLE.

The native cattle of the Shetland and Orkney Islands are quite distinct in character from the races in the mainland. They show a considerable resemblance to the Kerry cattle of Ireland, and, like these hardy animals, are well adapted to their surroundings.

They are small in size, and, as a rule, not of a high character. The true Shetland cow, however, is a handsome animal, with fine brown mellow skin and silky hair. On the poor scanty feeding which she generally obtains she gives a wonderfully rich yield of milk.

JERSEY AND GUERNSEY CATTLE.

The valuable breeds of the islands of Jersey and Guernsey have been imported into England and Ireland in large numbers during recent years. Where the chief object is the production of milk of a rich quality, these cattle are highly esteemed, and they are steadily growing in favour in the British Isles.

Origin.—There is hardly any doubt that, although the Jersey and Guernsey breeds are now so different in appearance, they were descended from one common origin. Be that as it may, it is known that they have been bred in absolute purity in their respective islands for upwards of one hundred years. In each breed the type is fixed with remarkable firmness, showing that the family current has all the strength of concentrated breeding for a long period of time.

Characteristics.—The Jersey and Guernsey breeds are both essentially dairy cattle. They give an abundant yield of rich, highly coloured milk. The Jersey is the smaller of the two, and is a delicate, attractive-looking animal, of a graceful deer-like form. It is of little value for the production of beef, but its milking properties are of a remarkably high order. When in full milking, whole herds of Jersey cows give an average of 9½ lb. of butter each cow per week, an exceptional cow occasionally giving as much as 16 lb. of butter in one week. Good

Jersey cows yield from 500 to 700 gallons of milk and from 300 to 350 lb. of butter in twelve months.

The Guernsey is larger in size than the Jersey, is a trifle hardier, and on the whole more generally useful. Guernsey cows occasionally give over 800 gallons of milk in twelve months. A noted cow, when 6 years old, gave 22½ lb. of butter in seven days, her daily yield of milk at that time being 19 quarts. These records, high as they are, however, have been exceeded in several instances, both in this country and in America.

A celebrated modern Jersey Cow is represented in Plate 22, vol. ii.

Plate 23, vol. ii., represents a noted modern Guernsey Cow.

SHEEP.

The British Isles are possessed of great wealth and of exceptional advantages in their large and diversified stock of sheep. Small as they are in area, the British Isles present great variety both in soil and climate. It is therefore natural and desirable that there should be many different races of live stock, with varying aptitudes and characteristics. It has been already seen that in regard to cattle, British farmers are in this respect well provided. If anything they are even better supplied in respect of sheep. There are throughout the British Isles even a larger number of races of sheep than of cattle, all possessing distinguishing features which adapt them in a special sense to their particular surroundings. The existence of these many local varieties of sheep is an undoubted advantage to the country, for by these our live stock industry has no doubt been more successfully developed than it could have been by a much smaller number of breeds, however meritorious.

In England and Wales alone there are some fifteen or sixteen varieties of sheep, all less or more distinct, and each with its own special *habitat*. The chief of these are the Leicester, Cotswold, Lincoln, Southdown, Shropshire, Hampshire, Oxford, and Suffolk breeds. Two important breeds in the south-west of England are the Devon Long-woolled and the Dorset horned breeds. The Romney Marsh sheep are useful animals of the long-woolled variety. In the mountain districts of West Somerset and North Devon the Exmoor breed is highly esteemed.

The Lonk breed of sheep, somewhat resembling the Scotch Blackfaced sheep, are kept in several parts of Lancashire, Yorkshire, and Derby, chiefly on the higher and poorer pastures. The Ryeland breed is one of the oldest in England, but it has been to a large extent supplanted by the improved Downs, and it is now in the hands of a very small number of flock-owners, the great majority of these being in their native county of Hereford. In Cumberland and other parts of the north of England the Herdwick breed is much thought of, and is cultivated with great success, having been considerably improved in recent years.

The Wensleydale sheep are a very useful class of animals. They are sometimes known as Yorkshire-Leicesters, are large in size, high standing, somewhat similar in appearance to Leicesters, and are much esteemed for crossing with other breeds, notably with Scotch Blackfaced ewes.

In Wales the Welsh mountain and Radnor varieties are extensively raised, and much valued for their hardiness and for the choice flavour and quality of their mutton.

In Scotland there are only three pure breeds of sheep specially associated with that country—namely, the Border-Leicester, Cheviot, and Blackfaced breeds.

In Ireland the only breed of sheep which has attained to the distinction of being classed as a breed is the Roscommon variety. They are large and ungainly, yet on the whole very useful sheep.

LEICESTERS.

This is the breed upon which Bakewell first tried his cunning hand. It is well entitled to rank as the pioneer of all our improved breeds of sheep, for it is acknowledged that Leicester blood has played an important part in the improvement of several other varieties, mainly, of course, those known as long and intermediate woolled sheep.

Characteristics. — The typical Lei-

cester is a thick, plump, rather short sheep; fine in the bone, broad back, usually very wide at the heart, clean, firmly set head, which is free from coloured wool and hair; mutton of medium quality, with a tendency to excess of fat; fleece averaging from 7 to 8 lb., and carcass exceeding 80 lb.

The Leicester is exceptionally well covered with flesh along the back, while the fore parts are deep and full, the neck being short, muscular, and well set into wide sloping shoulders, which do not rise above the level of the back. Formerly, bare heads were preferred; but latterly, and with good reason, heads which are protected from the fly by a covering on the top of close, short, white wool, are preferred.

Value for Crossing. — Upon rich abundant pastures, this breed does well in its pure condition; but its main value, perhaps, lies in its splendid properties for crossing with other races. It has been said that there is not a county in the British Isles, and probably few civilised countries in the world, where the Leicester or traces of its blood cannot be found. It hastens maturity and ameliorates the fattening properties of all varieties with which it is crossed. The Leicester is quiet, docile, moderately hardy, not very prolific, the wool being fine and fairly long.

Plate 24, vol. ii., represents an improved (1890) Leicester Ram.

COTSWOLDS.

The Cotswolds are the largest and highest standing of the long-woolled breeds. Like the Leicesters, their antiquity is well established. They have their home in the Cotswold Hills of Gloucestershire, which they are known to have inhabited in the days of Queen Elizabeth, when they were described as strong in the bone and long in the wool.

Origin and Improvement.—In recent times the Cotswolds have been vastly improved in form and in feeding properties. No doubt this advance in character has been brought about mainly, if not wholly, by selection in breeding and better management. It is regarded as more than probable, however, that a slight infusion of Leicester blood may have contributed to the result. In Bakewell's time, Leicesters were tried on the Cotswold Hills, but the climate was too severe for them, and they were soon abandoned. But in all probability the visit of the Leicester may have tended to accelerate the improvement of the native breed. Anyhow, alike in form, maturity, and weight, the Cotswold sheep of to-day are vastly superior to those of former times.

The patronage of the Royal Agricultural Society stimulated the improvement as well as the demand for Cotswolds; and although the breed is not, as a rule, exhibited in large numbers at the Royal Show, and does not cover a very extensive area of land, yet through its antiquity and intrinsic merit it is entitled to a prominent place among the leading varieties of sheep in England.

Characteristics.—The Cotswold displays a majestic appearance, with a huge, long, broad, regularly formed body, set evenly on long, clean legs; head large, clean, and handsome; features usually white, but sometimes grey or spotted, well woolled on the crown, with long curling locks hanging down the face. The neck is long and thick, the top line from shoulder to tail-head is long, broad, and level, with great covering of flesh and fat; ribs well sprung; under line often slightly irregular and deficient; the wool long, open, and curly, coarser in the staple than the Leicester, but heavier per fleece. Hoggets often reach or exceed 14 lb., and whole flocks, young and old, exceed an average of 7 lb. of wool per head. There is frequently rather an excess of fat along the back; but upon the carcass, in one place or another, there is a large percentage of lean meat of fairly good quality.

Cotswolds fatten rapidly with good treatment, and weigh, when about twelve months old, from 22 lb. to 25 lb. per quarter. Older sheep attain great weights; sometimes as much as 70 lb. per quarter, dead-weight.

Plate 25, vol. ii., represents an improved Cotswold Ram.

LINCOLNS.

The improved Lincoln breed is a successful blend of the Leicester and the

native sheep of the county. As wool-producers they stand pre-eminent in this country. Prior to about 1850 they were flat-sided, ungainly, slow-feeding sheep. Now, thanks to a judicious admixture of Leicester blood, and to careful breeding and management, they are vastly improved in form as well as in fattening properties; while their wool production has in no way deteriorated.

In the fairly rich pastures of their native districts no other breed can equal them as rent-paying sheep, and in recent years there has been a growing demand for Lincoln sheep, not only in other parts of England, but also in foreign countries. They are hardy and wonderfully prolific, about 30 per cent of the ewes producing twins, triplets being frequent, and now and again four lambs are dropped at one birth. The body of the Lincoln is smaller but more symmetrical than that of the Cotswold, the back broad and firmly fleshed, the ribs well sprung, the shoulder deep and wide, neck thick, head pretty strong, with good legs of lean mutton. It matures at an early age, and the fleece, which is long and lustrous in the staple, often exceeds 20 lb.—indeed as much as 26½ lb. of wool has been clipped from a fourteen-month sheep.

An improved Lincoln Ram is represented in Plate 30, vol. iii.

SOUTHDOWNS.

This breed justly holds the premier position amongst the short and intermediate woolled varieties. Indeed, like the Leicester amongst the long-woolled sheep, the Southdown has been the pioneer of the vast improvement which has taken place in these useful races, most of which have been benefited by a lesser or greater infusion of Southdown blood.

Characteristics.—The Southdown is a small-sized, low-set sheep, bigger than it looks, meat from head to heels, the perfection of symmetry, fine in the bone, active, fairly precocious, and in quality of meat surpassing all other English varieties. In the times of Arthur Young and Youatt, speckled faces were the order of the day. Now we will have none of these. Any departure from a uniform tint, varying from brown to fawn, is disliked. The forehead is covered with fine short wool, while a little soft wool on the cheeks is esteemed. The head backwards should be closely woolled, the neck thick and muscular, passing neatly into a wide cylindrical body, set on the shortest and finest of legs. They are as broad and as well covered with flesh and fat below as above, almost as wide behind as in front, and the Southdown leg of mutton is the thickest of any, and of course is also comparatively short.

The wool is close, fine, and short, weighing close on 4 lb. Southdowns mature more slowly than the long-woolled sheep, but have improved in this respect in recent years. The carcass of well-kept sheep from twelve to fourteen months old should weigh from 18 lb. to 20 lb. per quarter. The amount of offal is less than in any other breed, and they often yield 65 per cent of dead-weight to live-weight.[1]

A modern Southdown Ram is represented in Plate 26, vol. ii.

SHROPSHIRES.

The Shropshire breed of sheep has surpassed all others in the march of progress. It is fast spreading throughout the three kingdoms, and, excepting in high-exposed localities, is found to be an excellent rent-paying race. The Shropshire has been built up from the native sheep of the district from which it takes its name, a dash of Southdown blood having been employed by its earlier improvers. For many years, however, it has been maintained in its purity, and the characteristics of the breed are clearly defined and well established. It may perhaps be best described as a magnified Southdown, bigger all over, but partaking largely of the same features and properties. It is from 4 to 5 lb. heavier per quarter, matures earlier, fleece nearly twice as heavy but not so fine, and is little inferior in quality of meat. The face is darker, usually blackish brown, the head longer and thicker, and closely covered with wool on the top.

[1] In some notes on improvement in sheep, in Divisional vol. ii. p. 362, reference is made to the remarkable Southdown ram "Royal Newcastle." This fine sheep was bred and exhibited by Mr Edwin Ellis, Summersbury, Shalford, Surrey, and not by Mr J. J. Colman, as there indicated.

Shropshire rams are now extensively used for crossing purposes, the results being highly satisfactory.

An improved Shropshire Ram is represented in Plate 27, vol. ii.

HAMPSHIRE DOWNS.

Originating in a cross between the Old Wiltshire horned sheep and the Old Berkshire Knot with Southdowns, the Hampshire Downs are now well established as a valuable breed of sheep. The foundation was laid early in the present century, but it is only in recent years that the Hampshire Downs have attained the great excellence which now distinguishes them.

A trifle heavier than the Shropshire, the improved Hampshire Downs are scarcely so symmetrical, being higher on the leg, and lighter in the underline, but exceptionally good along the back, which is usually covered with lean meat in a manner not equalled by any other breed in the kingdom. They are big in the bone, head large, and a trifle coarse-looking, with strong Roman nose.

They have lately been much improved both in form and in fattening properties, and they now attain great weights at an early age. Indeed, the precocity of Hampshire lambs has become quite remarkable. The fleece is not heavy, from 4 to 5 lb., but is of fine quality.

An improved Hampshire Down Wether is represented in Plate 29, vol. iii.

OXFORD DOWNS.

The Oxford Down is a successful blend of the Hampshire and Cotswold breeds. It was founded before 1830, and is now as firmly established in its own distinctive features as either of the parent varieties. It has grown rapidly in public favour, and is much esteemed both for rearing in purity and for crossing purposes. It is spreading throughout England, and is making its way into Scotland, where Oxford Down rams are being very successfully crossed with the mixed bred ewes of that country.

In an admirable manner the Oxford Downs combine the meat-producing properties of the Hampshire with the wool-yielding qualities of the Cotswold. They give a good fleece, weighing on an average from 6 lb. to 7 lb., shearling rams often yielding as much as 20 lb. of wool. They mature early, giving mutton of excellent quality, weighing 20 lb. per quarter when twelve to fourteen months old.

The face is dark in colour; the body thick and well proportioned, with a broad, thickly padded back. The proportion of lean mutton is comparatively large.

An improved Oxford Down Ram is represented in Plate 28, vol. iii.

SUFFOLK SHEEP.

This is a variety of the Downs which has been vastly improved since 1870. It is a hardy, active, profitable sheep, maturing early, excelling in the production of lean meat.

In outward form the Suffolk sheep is not unlike the Hampshire, but more compact, and finer in the head. Its improvement is being promoted with commendable energy by its leading breeders, who have formed themselves into a society for the purpose.

Plate 31, vol. iii. represents an improved Suffolk Ram.

DEVON LONG-WOOLS.

This breed, which is a very favourite one in the Vale districts of North and East Devon, West Somerset, and some parts of Cornwall, is a cross between the old Bampton variety and the Leicester. The Bampton was one of the native breeds of Devon, and was a middle-woolled sheep, but its alliance with the Leicester gave length of staple and larger quantity to the fleeces, so that the variety has ever since been classified as distinctly long-woolled. The history of the ancient Bampton stock is lost in obscurity.

From about 1820 to 1830 these sheep still bore the name of Bamptons, although some were beginning to call them Devon-Notts. The late Mr Andrew Hosegood recollected them at this period as having grey faces, and has left it on record that "they were very hardy, and excellent for weight of mutton and wool." As regards weight of carcass, Mr Hosegood considered that it surpassed that of their descendants after more Leicester blood

had been infused, although earlier maturity and greater aptitude to fatten were derived thereby. Wilson, writing on the various breeds of sheep in the *Journal of the Royal Agricultural Society* for 1855, says of the Bampton variety: "Like most of the old indigenous breeds of the county, it has gradually been displaced by the improved breeds, and now it is very difficult to find the pure Bampton unmixed with other blood, few only now remaining in Devon and West Somerset."

There was an endeavour some years since to get the breed christened the Devon-Leicester, but Devon Long-wool is the appellation now generally applied, and much more uniformity of type is observable in sheep belonging thereto now brought to the showyards than was the case prior to 1870.

DORSET HORNED SHEEP.

The old type of this breed was native to the Dorset hill district, and probably the little Portlander was a branch of it. While the latter is getting very scarce, the former of legitimate ancient type is now entirely extinct, the modern Dorset Horn being the progeny of a cross with the Somerset Horn, which had a longer body and larger size. Even when Claridge wrote his *Survey of Dorset* to the Board of Agriculture in 1793 this change had been wellnigh accomplished, for he remarked therein,—"The original breed of Dorset sheep is very scarce to be met with, as most of the farmers have crossed their flocks with either Hants, Wilts, or Somerset sheep, which certainly improved them in size."

The Dorset hill country was the battle-field between the old Horned variety and the Southdowns in the last century. The latter always cropped the fine herbage of the chalk hills better than their competitors, but the contest chiefly bore on the wool question. The fleece of the Southdown, although light, was of exceeding value, for the chief dependance of our cloth manufacturers for short wools was either on that variety or on flocks of the Ryeland breed until the Australian colonies became stocked with large merino flocks. Ultimately they were driven off the highest ranges of the chalk hills; but in Western Dorset, where the chalk gives place to greensand, oolite, and lias, and the pastures are less elevated and more productive, they have never been displaced, nor indeed are likely to be. In fact, since their great improvement in grazing character, they have been preferred to either Southdowns or Hampshires on many farms in the neighbourhood of Dorchester and Puddletown having water meadows, and consequently have reconquered some of the territory won from them previously. Eastward, throughout the Isle of Purbeck, probably there are at the present day more Dorset Horned flocks than existed half a century ago.

Few breeds at the present day are possessed of greater uniformity of type than the Horned race of Dorset and Somerset. The breed deserves to bear the name of one county as much as that of the other, and in fact the sheep are often called Somerset Horns. At any rate, the breeders of Somerset have brought it into showyards more than those of the other county. Mr Thomas Danger was for many years the principal exhibitor, but during the past two decades it has been Mr Herbert Farthing. The flocks of both are associated with the district between Taunton and Bridgewater.

BORDER LEICESTERS.

Mr John Thomson contributes the following sketch of this valuable breed:—

Historical.—The Border Leicester has been known under that name for only a comparatively short time—only since about 1860. Before this, although its distinct characteristics had been glaringly apparent, it was classed along with the English sheep descended from the same source, and termed the Leicester, or the Improved Leicester. The Border and the English Leicesters were so widely different in their form and wool, that it became impossible they could compete satisfactorily in the same classes; as the judges in the showyards, however carefully chosen, could not be otherwise than biassed. When the majority happened to be breeders of the English variety, the premiums went very naturally, though none the less consistently and surely, to the type they favoured, and *vice versa*. If the judges

were solely on one side, then a grave injustice followed. The position became the more acute as in the course of time the differences apparent in the two varieties widened; and at length it was found necessary to have distinct classes for the variety under notice, which has since been known as the Border Leicester. So recently as 1868, all Leicesters, whether from the Midlands of England or the Border counties, were forced to compete in the same classes at the shows of the Royal Agricultural Society; but next year, at the Manchester meeting, they were divided as in Scotland.

Both varieties had their origin at Dishley, near Loughborough, where Mr Robert Bakewell began to improve the sheep he found around him in or about 1755. The precise method adopted by Bakewell is unknown, as a certainty. It is believed by some that he crossed the sheep of his shire of Leicester—"said to have been large coarse animals, with an abundance of fleece and a fair disposition to fatten"—with other long-woolled breeds, probably possessing smaller frames and more symmetrical proportions. Another and highly probable theory is, that without going beyond the sheep at his hand, he boldly adopted this material, and by breeding from selected animals of close affinities, and continuing this system as far as was advisable, he managed to establish a distinct breed, whose main characteristics were large yet symmetrical frames, carrying heavy flesh upon fine bone, decided aptitude to fatten upon a moderate quantity of food; and capable of being brought early to maturity, while bearing a fleece of large weight and superior quality.

To the writer it is evident that the materials, whatever they may have been, which Bakewell used, must have been very plastic, since his improvements were quick in displaying themselves. So early as 1760, he commenced letting his rams for a guinea for the season's use. The reputation of the Dishley flock increased by "leaps and bounds," rising to such a pitch that twenty years after he commenced to let rams, Bakewell received no less than £3000 in hire fees in a single season. In 1789, it is stated that he netted £6000 by the letting of his tups. So general was the breeze of improvement in sheep stock about that time that it was computed no less than £100,000 were annually spent by Midland agriculturists in procuring sires. Large although this sum is, it is not altogether improbable, considering that in 1789 Bakewell received from £1000 downwards for the season's use of a single ram.

Such being the condition of sheep-breeding in the Midlands, it need not be marvelled at that agriculturists in far off shires, even in these days of slow, tedious, and imperfect communication, should have desired to share in the results which others had accomplished.

When Bakewell commenced his improvements, two brothers, George and Matthew Culley, were farming at Denton, not very far from Darlington. In 1762 and 1763, the brothers visited and became intimate with Bakewell, and from Dishley they brought rams with which they crossed the native Teeswater sheep, which then stood in high favour as a long-woolled breed. Proceeding in this manner, they were not long in forming a flock of their own, which was transferred to North Northumberland in 1767—the Hegira of the Culleys—when they took the farm of Fenton, near Wooler, and subsequently Crookham Eastfield, on Tillside,—Wark, on Tweedside,—as well as other farms in the district, until the brothers paid an aggregate rental of £6000 a-year. After having bred in North Northumberland for nearly forty years, the Culleys retired in 1806, when their sheep were sold out.

Mr Robert Thomson, who, like one of the Culleys, had been a pupil with Bakewell, also took a leading part in the introduction of the breed. He farmed at Lilburn, and afterwards at Chillingham Barns; and his flock, long known as one of the very best on the Borders, was bred directly from Bakewell's. It was at Lilburn that the first sale by auction of Bakewell sheep took place in the north. At Chillingham Barns, Mr Thomson held annual lettings, and there, in May 1814, his entire flock was dispersed.

A part of Mr R. Thomson's flock passed into the possession of Mr James Thomson, Bogend, Duns, who had also formerly obtained rams from the Culleys

and from Chillingham Barns; and it may be stated that this flock is still in existence, being now in the hands of Mr James Thomson, Mungo's Walls, a grandson of the tenant of Bogend. Having been bred by the Thomsons for upwards of a century, the Mungo's Walls flock forms the most perfect connection between the time of Bakewell and the present day in the history of the breed. It seems there were in Bakewell's flock two types of sheep, known as "blue-caps" and "red-legs," the latter being much the hardier of the two; and from what the writer has been able to learn, Mr Thomson's sheep were of this hardier sort.

Rams from the flocks of the Culleys and Mr Thomson must have been very early and very generally used in the district around them as well as north of the Tweed, since flocks had multiplied to a wonderful extent at the time of the dispersion of the Culley sheep. Whether these other breeders obtained ewes of the improved breed or "bred in" from the ordinary country stock with Dishley rams it were now difficult to determine satisfactorily. Yet this question affects the purity of the breed in later times to a grave extent, and certainly gives weight to the prevalent impression that there is much Cheviot blood in the Border Leicester. It is next to an impossibility that all of the Tweedside, Glendale, and "Barmshire" breeders could have obtained their stock ewes and gimmers from Thomson and the Culleys so quickly and to the extent necessary to account for the size and number of the flocks in 1806. Besides, these pioneers were chary in parting with females.

The subject is a difficult one to treat of satisfactorily, and is referred to here only in a suggestive way. One thing is most evident: that flocks of "improved Leicesters," whether pure — relative though the term may be—or not, sprang up like the proverbial mushrooms in North Northumberland, from which they quickly spread into Berwickshire and Roxburghshire.

The Mertoun Flock.—As was aptly stated of a famous herd of shorthorns, the history of the Mertoun flock is virtually the history of a breed. It was founded by Mr Hugh Scott of Harden, grandfather of the present Lord Polwarth, in 1802, and for about thirty years to this date (1890) it has been entirely a self-supporting flock, not a single animal, male or female, being introduced from any other flock during all this time. It has consequently long been and still is a matter for surprise and comment that the sheep have all through combined remarkable constitutions, and large and robust frames with unusual fertility; at the same time being living evidences of the purest breeding, as shown in their blood-like heads, elegant forms, and stately and graceful movements. There can be no question that that at Mertoun is emphatically a self-supporting and self-supported flock.

Rams from the Mertoun flock have for many years been keenly sought after by other breeders, and in 1890 Lord Polwarth's 30 shearling rams sold at Kelso brought within a few pence of £54 per head, one ram realising £155.

Characteristics.—As already stated, there were two families in Bakewell's flock, the "blue-caps" and "red-legs." Formerly "blue-caps" were pretty common on the Border, but for a long period the "red-legs," owing to their greater hardiness, have held possession. Their representatives of the present day are admirably described by Mr John Usher, in *The Border Breeds of Sheep*, thus: "The head of fair size, with profile slightly aquiline, tapering to the muzzle, but with strength of jaw, and wide nostril; the eyes full and bright, showing both docility and courage; the ears of fair size and well set; the neck thick at the base, with good neck vein, and tapering gracefully to where it joins the head, which should stand well up; the chest broad, deep, and well forward, descending from the neck in a perpendicular line; the shoulders broad and open, but showing no coarse points; from where the neck and shoulders join to the rump, should describe a straight line, the latter being fully developed; in both arms and thighs the flesh well let down to the knees and hocks; the ribs well sprung from the backbone in a fine circular arch, and more distinguished by width than depth, showing a tendency to carry the mutton high, and with belly straight, significant of small offal; the legs straight with a fair amount of bone,

clean and fine, free from any tuftiness of wool, and of a uniform whiteness with the face and ears. They ought to be well clad all over, the belly not excepted, with wool of a medium texture, with an open pirl, as it is called, towards the end. In handling, the bones should be all covered, and particularly along the back and quarters (which should be lengthy) there should be a uniform covering of flesh, not pulpy, but firm and muscular. The wool, especially on the ribs, should fill the hand well."

That Mr Usher's description is just as a whole, will readily be conceded. However, the present writer may be permitted to add to it a few observations, not altogether unnecessary. He is quite well aware that many of the best sheep in most flocks are occasionally flesh-coloured in the muzzle, but it is regarded as an evidence of hardiness to have it perfectly black; therefore in any general description this point ought to be urged. The ears should be of moderate length, and boldly set, but thickness, even at the base, in shearling rams as well as in ewes should be a disqualification. Again, the ear should neither be too much flesh-coloured, nor blue nor purple. A darkish —not a brownish—skin, covered with fine white hair, is most to be preferred, although black spots are not at all objectionable. Then the face should be covered with short white hair; and on no account should there be any blueness. Corded or scored faces are specially to be avoided in females and shearling rams. These are considerations of primary importance. The legs, from where the wool ceases to grow, should be covered with short white hair; the "cluits" should be black, and the pasterns as upright as possible.

The "blue-caps" of by-past times have been described by the late Mr John Grey, Dilston, as having "blue faces, generally bare on the scalp, and red when lambed; and when mature, easily broken by flies; on which account they were not favourites with the shepherds. They were good feeders, but light of wool." It is evident what are now termed English Leicesters are the representatives of this Bakewell family, although time has both modified and accentuated their former characteristics. The English sheep has a bluish grey or white face, often corded, and usually carries a tuft of wool on the head (which keeps off the flies), while it is also woolled on the shanks. The skin is pink all over, while the wool is thick and curly. It is not such a large-framed sheep as the Border Leicester, and is considerably shorter in both neck and legs; but it is much more compact, wider through the heart, and heavier in front in proportion to its size. It is also a much deeper sheep; at the same time it is "baggy" below, and has not that appearance of lightness of offal which is the great feature of the Border sheep. The bone, too, is finer, and from what the writer can remember of a representative flock he saw a few months ago, the amount of mutton carried, size considered, is greater than that of the Border sheep. They seemed to one who all his life has been partial to Border Leicesters to lack style altogether, and the clipped sheep reminded forcibly of well-filled wine-skins in engravings of oriental subjects; but they fulfilled Bakewell's toast—"Small in size and great in value" —or, as their breeder characteristically put it: "What do I care about your fancy heads, lugs, and style? Look at the loads of mutton: that pays the rent!"

Except as ram-breeding flocks, Border Leicesters are not now kept to the same extent as they formerly were; the mutton being too coarse in its texture, and the fat too much of the consistence of tallow to be put to a profitable use, or please the palate. These are drawbacks to the general utility of a breed which has few rivals in reaching early maturity, and in producing the greatest weight of mutton and wool in a given time. Its outstanding merit lies in its pre-eminent suitability for crossing with other breeds, such as the Cheviot, Blackfaced, &c. The cross with the former is the most popular, the produce of the Border Leicester ram and the Cheviot ewe being termed a half-bred. On most turnip and barley farms a stock of half-bred ewes are kept, which being again crossed with the Border Leicester ram, produce three-parts-bred lambs. These quickly develop, and being fed at high pressure, are generally in the butcher-market before they are a year old.

A modern Border Leicester Ram is

represented in Plate 33, vol. iii. A typical Border Leicester Ewe is illustrated in Plate 32, vol. iii.

BLACKFACED SHEEP.

Origin.—The origin of this ancient breed is obscured in antiquity. It is conjectured that it is not indigenous to Britain; that it is of foreign origin, and was imported by one of the Scottish kings for the use of the royal household. We are inclined to believe, however, that it originated amongst the mountains in the north of England and in Scotland. Be this as it may, the form and general independent bearing of the sheep point it out as the native of high and stormy regions.

Differences in Type.—The influence of soil and climate on the quality of both wool and mutton is considerable, so marked, indeed, as to cause a variance, not only in the type of sheep reared, but also in the system of management pursued. In the West of Scotland, for example, the prevailing type differs from that in the central counties. It partakes more of a parallelogram, so to speak, than the Mid-Lothian sheep; has longer sides, and is altogether a bigger and rougher sheep. The sheep of the higher altitudes and of the far North, too, have certain peculiarities. They are lighter in type than the Lothian sheep, extremely hardy, and less disposed to fatten. These latter points are indispensable in the real mountain sheep.

Famous Flocks. — Amongst the pioneer improvers of the blackfaced breed, the more noted are Mr Howatson of Glenbuck, Messrs Archibald, Overshiels, and Mr Foyer, Knowhead, Campsie. The celebrated Glenbuck stock is perhaps the oldest in the country. It has possessed a well-earned reputation for upwards of a century. It has been distinguished for superiority of blood and excellence of type. The celebrated Overshiels flock is also a reliable and much-prized source of pure blood.

Blackfaced sheep are unequalled for hardiness, and as rent-paying stock for the great part of Scotland they are superior to all other breeds.

A famous Blackfaced Ram is represented in Plate 34, vol. iii.

CHEVIOTS.

Origin. — Northumberland was the actual birthplace of the Cheviot, and is still largely inhabited by it. It was early introduced into the Border counties of Scotland, and these may now be regarded as the principal stronghold of the breed. A greater area of suitable climate, altitude, grass and turnip-growing, and, it may be, greater energy on the part of farmers, have given to Scotland unquestionable superiority in the breeding of Cheviots.

Characteristics.—The breed is naturally very hardy, and can subsist at an elevation suitable to only one other breed —the Blackface. The face and legs of the Cheviot are covered by short, wiry, pure white hair, which extends over the ear, and well back behind the head. In some instances the ram is horned; in others he is hornless. His nose is highly arched, nostrils black, and eyes dark, full, and bright. The wool is moderately long and very close set—straight, and free from kemp—covering equally and well all parts of the body, including legs down to the knees and hocks. The clip of wool, which is generally shorn early in July, runs from 3 to 4½ lb. per head. In its wealth of mutton, the Cheviot outweighs the Blackface. Wethers from the hills, three years old, killed and dressed, scale from 70 to 80 lb.; while others a year younger, if fed on turnips, usually attain about the same weight. Cast ewes are purchased by Lowland farmers for crossing purposes. They are mated with Lincoln, Border Leicester, or Wensleydale rams, the result of which is a half-bred stock now extensively fed on the lower arable farms in Scotland.

Improvement of the Breed. — To look back upon ancient sketches of the Cheviot sheep which we find occasionally in historical books, affords one acquainted with the existing class of stock a pretty good idea of the great strides that have been made in the improvement of breed. Without some such data, indeed, it would be almost impossible to suppose so much really good work had been done. In the counties of Northumberland, Berwick, Roxburgh, Selkirk, Haddington, Dumfries, and Sutherland, attention has been

effectually directed to the amelioration of the breed. The best flocks are to be met with in the neighbourhood of the Borders, where the smaller but thicker and more compactly built Cheviot reigns supreme. Foremost among its promoters have been the Robsons of Northumberland, the Elliots of Roxburgh and Selkirk, and Mr Brydon of Kennelhead. The stock shown by the Robson brothers at the leading agricultural shows in recent years have been exceedingly creditable. The Hyndhope stock, so long associated with the name of Elliot, is about the oldest in Scotland, and contains the finest strains of blood. They are of the small-sized close-woolled sort, which for hill pasture is considered superior to the heavier sheep with opener skins reared in Dumfriesshire.

An improved Cheviot Ram is illustrated in Plate 35, vol. iii.

ROSCOMMON SHEEP.

The Roscommon is, as already indicated, the only variety of sheep in Ireland dignified by the title of breed. It is a native race, improved by selection and by the infusion of Leicester blood. Large in size and often somewhat ungainly in form, the Roscommon sheep are extensively reared in Connaught, where they hold a good name as rent-paying stock. The fleece is long, heavy, and of good quality.

WEIGHTS OF SHEEP.

It may be interesting to give here the following figures showing the live-weights of wethers and lambs of the leading English breeds of sheep exhibited at the Smithfield Fat Stock Show in December 1886, the heaviest pens being selected in each case, and the weights being the average for the three animals in each pen :—

	Lambs over 12 and under 24 months. lb.	Lambs 9 to 10 months. lb.
Leicester . .	273	154
Cotswold . .	322	194
Lincoln . .	312	193
Southdown .	214	181
Shropshire .	254	143
Hampshire .	282	233
Oxford . .	277	183
Suffolk . .	290	179

SWINE.

It might be thought to be impossible to draw up a scale of points which would be strictly applicable to the whole of the many improved varieties of pigs. Perhaps this view is a correct one, yet we think it may be possible to sketch the points of a useful pig according to the ideas of the producer, of the fattener of the pig, and of the butcher and the bacon-curer, all of whom have to study the wants or fancies of the consumer. At all events the attempt was made some few years since by Mr Sanders Spencer when he was Honorary Secretary of the National Pig Breeders' Association. This scale of points was adopted by the Council, as were the more precise descriptions of the points sought for in those breeds of pigs, the pedigrees of which are recorded in the herd-book. We give the scale, and we have also taken the description as a foundation for our remarks upon the six principal varieties of pigs — namely, Berkshires, Small Blacks, Large Whites, Middle Whites, Small Whites, and Tamworths.

Points of the Different Breeds.

	Points.
Head wide and deep, lower jaw sprung	10
Neck muscular and rather long . .	5
Shoulders wide but not open . .	10
Fore legs straight and well placed outside the body . .	7
Ribs well sprung and deep . . .	12
Loin wide, not slack	8
Flanks deep and full	7
Quarters long and straight from hip to tail	13
Hams wide, with meat down to the hocks	10
Hind legs placed well outside and not too much under the body . .	5
Bone flat and not coarse . . .	6
Hair long and silky, but without mane or bristles along the neck and shoulders	7
Total . .	100

To the foregoing general standard may be added the following distinctive characteristics :—

Berkshires.—Colour, black, except feet and tip of tail, which should be white, and white blaze or mark down the face. Fair quantity of hair of fine quality. Skin without rucks or lines.

Blacks.—Colour, black. Head and body

slightly longer than Small Whites; other points similar.

Large Whites.—Colour, white, occasionally with blue spots on the skin, but without black hair. Head rather long, wide between the ears, which should be inclined forward. Size, if accompanied by quality, of great importance.

Middle Whites.—Colour as above. Head shortened and ears pricked. Body generally more compact, on shorter legs. Hair abundant and silky.

Small Whites.—Colour, white without blue spots. Head short, jowls heavy, ears pricked. Body short, thick, wide, and close to the ground. Tail fine. Hair abundant, silky and long, not curly. Skin thin and free from scurf.

Tamworths.—Colour—red with dark spots on the skin; other points as near as possible approaching the general standard.

BERKSHIRES.

Berkshires have undergone considerable changes in recent years both in their formation and in their colour. Within the last forty years many of the best pigs of the breed were black, with white or sandy spots, long and deep in the body, which was well covered with rather strong hair; the head was long, the jowls light, and the ears pricked.

The Berkshire breed appears to have been the first to be taken in hand by wealthy men and connoisseurs to be improved, and from this process has evolved the present type, which may be described as a black pig, barring a white star or shine on the forehead, white feet as far as the ankles, and having a white tip to the tail; the head comparatively short, the jowls and shoulders heavy, the ribs well sprung, carcass deep, loin wide, and the hind quarters well developed, just the form of a pig to supply prime joints of small pork, such as bring the highest prices in the London market, where the pigs are termed London porkets, and should weigh not more than 70 to 80 lb. It is also admirably suited for exhibition at our fat stock shows, as a Berkshire will stand almost any amount of forcing and cramming without losing its form.

Having these valuable and much-sought-after qualities, it can scarcely be expected that a Berkshire is so well suited for the present demand for pigs which mature early, and yet furnish at six months old those long, deep-sided, lean-fleshed carcasses of 160 lb. weight, which the present tastes of the public and the bacon-curer demand.

LARGE WHITE BREED.

These qualities are most commonly found associated with pigs of the Large White breed, or, as the best of them are now being called in Canada and in several foreign countries, Improved Yorkshires. The colour of these should be white, but on some of the best of the successful show pigs of some ten or fifteen years since blue spots on the skin were by no means infrequent. This did not necessarily prove that a cross of the Berkshire or of some other breed had been introduced, for the purest bred of the Large White pigs were not free from the discoloration in the skin. But it is an open secret that some exhibitors were believed to have a liking for the more compact Berkshire or the Middle White—a longing to get the broad backs, short heads, and heavy jowl which unfortunately for pig-breeders were at that time, and even sometimes now are, in great favour with a certain set of judges, who place a higher value on symmetry than on utility.

These blue spots are far less frequent now than formerly, and will eventually be bred out.

The head of the Large White pig should be of fair length, the lower jaw nearly straight, the jowls, neck, and shoulders light, the forehead broad, the ears proportionately large and inclined forward, not so heavy as to deserve to be termed lop ears, which cover the eyes and render the pig to all intents and purposes blind; the legs should be straight and placed well outside the body, the bone not being coarse and round, the ribs deep and well sprung, loin fairly wide and not slack, quarters long and square, and hams wide and deep. Soft hair, and plenty of it, indicates early maturity and lean meat, the two great essentials.

MIDDLE WHITE BREED.

Middle White pigs should possess all the good points of the Large White, but altogether on a smaller scale, with heads

shorter, ears more erect, hair finer and in greater quantity, bone finer and legs shorter.

SMALL WHITE BREED.

Some go so far as to say that the Middle White pig should be an enlarged Small White. From this we are inclined to differ, as the latter does not at the present time appear to satisfy the requirements of the farmer or the bacon-curer: the body is too small and too short, and the proportion of lean to fat too small. A well-bred Small White is a handsome pig: its short snout, profusion of silky hair, fineness of bone, high quality, and docility of disposition are to be admired; but the current demand is for something more useful even if less ornamental.

SMALL BLACK BREED.

The Small Black is very much after the same style as the Small White, except that the colour is a whole black, the hair less profuse, and perhaps the carcass somewhat longer. It is nevertheless much liked in some of the Eastern and South-Western counties. In parts of the counties of Cambs, Essex, and Suffolk, it used to be a very common practice to run these black pigs on the clovers during the summer, and it was claimed by the followers of this system that the sun affected the skin of the black less than that of the white pig.

TAMWORTH PIGS.

The Tamworth is a red pig, with occasional black spots, and is one of the oldest varieties in the country. By judicious mating and infusion of alien blood the Tamworth has been improved, the nose has been considerably shortened, and the body lengthened and made deeper, the legs are shorter and the ears longer, whilst the colour of the hair and skin is lighter, and quality finer. Considerable numbers were exported to the bacon-curers in Denmark, Germany, and Sweden; but the improvement to the native pigs was not marked, so that the foreign demand has fallen away.

OTHER BREEDS.

There are various other local breeds, such as the newly named Oxfordshire pigs, which have for fifty years been bred in Northamptonshire, Leicestershire, Buckinghamshire, and Oxfordshire. They are evidently a cross of the White, the Black, and the Sandy or Tamworth breeds, and they are very prolific and make capital scavengers, and furnish good carcasses of meat, but they require more time for development.

Typical pigs of the Large White and Berkshire breeds are represented in Plate 36, vol. iii.; of the Middle White and Tamworth breeds in Plate 37, vol. iii.; and of the Small Black and Small White varieties in Plate 38, vol. iii.

SHEEP DOGS.

The collie dog is well entitled to mention amongst the live stock of the farm. It is a faithful and worthy servant, absolutely essential upon sheep farms.

The natural temper of the shepherd may be learned from the way in which he works his dog among sheep. When you observe an aged dog making a great noise, bustling about in an impatient manner, running fiercely at a sheep and turning it quickly, biting at its ears and legs, you may conclude, without hesitation, that the shepherd who owns it is a man of hasty temper. Most young dogs exhibit these characteristics naturally, and they generally overdo their work; and if you observe a shepherd allowing a young dog to take its own way, you may conclude that he also is a man of hasty temper or careless of his flock. If you observe another shepherd allowing his dog, whether old or young, to take a range round the fences of a field, driving the sheep as if to gather them, you may be sure he is a lazy fellow, more ready to make his dog bring the sheep to him than he to walk his rounds to see them.

Great harm may accrue to sheep by working dogs in these ways. Whenever sheep hear a dog bark that is accustomed to hound them every day, they will instantly start from their grazing, gather together, and run to the farthest fence, and a good while will elapse ere they will settle again. And even when sheep

are gathered, a dog of high travel, and allowed to run out, will drive them hither and thither, without an apparent object. This is a trick practised by lazy herds every morning when they first see their flock, and every evening before they take up their lair for the night, in order to count them with what he deems the least trouble to himself. When a dog is allowed to run far out, it gets beyond the control of the shepherd; and such a style of working among wether sheep puts them past their feeding for a time: with ewes it is very apt to cause abortion; and with lambs, after they are weaned, it is apt to overheat them, induce palpitation—and a considerable time will elapse before they recover their natural breathing. Whenever a sorting takes place among sheep, with such a dog they will be moved about far more than necessary; and intimidated sheep, when worn into a corner, are far more liable to break off than those treated in a gentle manner. When you ordinarily hear at a distance a great noise from the dog among the sheep, you may depend upon it the shepherd is not the man that is fit for your service.

A judicious herd works his dog in quite a different manner. He never disturbs the sheep when he takes his rounds amongst them at morning, noon, and night—his dog following at his heel as if he had nothing to do, but ready to fulfil its duty should any untoward circumstance arise, such as breaking out of one field into another. When he gathers sheep for sorting, or catching a particular one, the gathering is made in a corner, to gain which he will give the sheep plenty of time, making the dog wear to the right and left, to direct the sheep quietly to the spot; and after they are gathered, he makes the dog watch, and, with an occasional movement, prevent any sheep breaking away. When a sheep does break away, and must be turned, he does not allow the dog to bite it, or even to bark, but to give a bound against its head, and thus turn it. In turning a blackfaced wether in this way, the dog runs the risk of receiving injury from its horn, to avoid which it seizes the coarse wool of the buttock, and hangs on by it like a drag, until the sheep turns round, when it lets go.

In short, a thoroughly good shepherd only lets his dog work when its services are actually required, he bestowing his own labours ungrudgingly, and only demanding assistance from his dog when he cannot do it so well by himself; and at no time will he allow his dog to go beyond the reach of his immediate control. Dogs, thus gently and cautiously trained, become very sagacious, and will diligently visit every part of a field where sheep are most apt to stray, and where danger is most to be apprehended—such as a weak part of a fence, water-runs, deep ditches, or deep furrows into which sheep may possibly fall and lie *awalt* or *awkward*—on the broad of their back, unable to get up—and which they will assist to raise up by seizing the wool at one side and pulling the sheep over upon its feet. Experienced dogs will not meddle with ewes having lambs at foot, nor with tups, being well aware of their disposition to offer resistance. They also know full well when foxes are on the move, and give evident symptoms of uneasiness on their approach to the lambing-ground. They also hear footsteps of strange persons and animals at a considerable distance at night, and announce their approach by unequivocal signs of uneasiness by whinging and restlessness, aware that noisy sounds would alarm the sheep. A shepherd's dog is incorruptible, cannot be bribed with a bite of food, and will not permit even a known friend to touch it or its charge when intrusted with an act of duty.

Varieties of Collies.—There are, we believe, at least two varieties of the sheep-collie,—one smooth, short-haired, black on the back, white on the belly, breast, feet, and tip of tail, with tan-coloured spots on the face and legs; the other larger and longer-bodied, having long rough hair of different colours, patched or intermixed, and long flowing tail. Fig. 774 is a portrait of the rough-haired class on the watch. In their respective characters we conceive them to be very like the pointer and the setter. The small smooth kind, like the pointer, is very sagacious, slow, easily trained, and admirably suited to work in an enclosed low country among Leicester sheep; the other, like the setter, is more swift, bold, ill to break, requiring coercion, and fitter

for work on the hills among Blackfaced sheep. Our liking is to the smooth-haired, and we like to hear both kinds named *collie*. The *white* tip on the point of the tail is a sure mark of true breeding.

Training Collies.—Most shepherds profess to train young collies, wherein many display much ignorance of the nature of the breed, and of the aptitude of the particular individual for its peculiar work; and hence many dogs are unfit for useful service. Every collie-pup has a natural instinct for work amongst sheep; nevertheless, they should be trained with an old dog. Their ar-

Fig. 774.—*Shepherd's dog or collie.*

dent temperament requires subduing, and there is no more effectual way of doing this than keeping it in company with an experienced dog. A long string attached to the pup's neck, in the hands of the shepherd, is necessary to make it become acquainted with the language of the various evolutions connected with work. With this contrivance it may learn to "*hold away out by*," "*come in*," "*come in behind*," "*lie down*," "*be quiet*," "*bark*," "*get over the dyke*," "*wear*," "*heel*," "*kep*." It will learn all these terms, and others, in a short time. It is said the bitch is more acute in learning than the dog, though the dog will bear the greater fatigue. Of the two, I believe the quietly disposed shepherd prefers the bitch, and is chary of working her when in pup.

Sagacity of the Collie.—A volume would not contain what might with truth be said of the sagacity and faithfulness of the collie. Suffice it to give a few sentences, which we know to contain correct information. "If he be but with his master," observes Youatt, "he lies content, indifferent to any surrounding object, seemingly half asleep and half awake, rarely mingling with his kind, rarely courting, and generally shrinking from the notice of a stranger. But the moment duty calls, his sleepy listless eye becomes brightened, he eagerly gazes on his master, inquires and comprehends all he is to do, and, springing up, gives himself to the discharge of his duty with a sagacity and fidelity and devotion too rarely equalled even by man himself." "If we consider," says Buffon, "that this animal, notwithstanding his ugliness and melancholy look, is superior in instinct to all others; that he has a decided character, in which education has comparatively little share; that he is the only animal born perfectly trained for the service of others; that, guided by natural powers alone, he applies himself to the care of our flocks—a duty which he executes with singular assiduity, vigilance, and fidelity; that he conducts them with an admirable intelligence, which is a part and portion of himself; that his sagacity astonishes at the same time that it gives repose to his master, while it requires great time and trouble to instruct other dogs for the purposes to which they are destined; if we reflect on these facts, we shall be confirmed in the opinion that the shepherd's dog is the true dog of nature, the stock and model of his species."

The ugliness ascribed to the appearance of the shepherd's dog by Buffon is only applicable to the shepherd's dog—we cannot call it a collie—in Continental countries, for a more handsome and beautiful dog than our collie cannot be seen anywhere. "The shepherd's dog," remarks Graguier, "the least removed from the natural type of the dog, lives and maintains its proper characteristics while other races often degenerate. Everywhere it preserves its proper distinguishing type. It is the servant of man, while other breeds vary with a thousand circumstances. It has one appropriate mission, and that it discharges in the most admirable way; there is

evidently a kind and wise design in this." The Ettrick Shepherd truly says that "a single shepherd and his dog will accomplish more, in gathering a flock of sheep from a Highland farm, than seventy shepherds could do without dogs; in fact, that, without this docile animal, the pastoral life would be a blank. It would require more hands to manage a flock of sheep, gather them from the hills, force them into houses and folds, and drive them to markets, than the profits of the whole flock would be capable of maintaining. Well may the shepherd feel an interest in his dog: he it is indeed that earns the family bread, of which he is himself, with the smallest morsel, always grateful and always ready to exert his utmost abilities in his master's interests. Neither hunger, fatigue, nor the worst of treatment will drive him from his side, and he will follow him through every hardship without murmur or repining." [1]

In the course of some conversation relating to dogs, Governor Anderson of Ohio related a Texan practice in training dogs with sheep. A pup is taken from its mother before its eyes are opened, and put with a ewe to suckle. After a few times the ewe becomes reconciled to the pup, which follows her like a lamb, grows up among and remains with the flock; and no wolf, man, or strange dog can come near the sheep; and the dog will bring the flock to the fold regularly at half-past 7 o'clock P.M. if you habitually feed him at that time.

AILMENTS OF FARM LIVE STOCK.

It is not presumed that the farmer should become so familiar with veterinary science as to be able to dispense with the occasional services of the professional Veterinary Surgeon. The farmer, however, should unquestionably know enough of the ailments which afflict his live stock to enable him to recognise the symptoms of each when he sees them, and also to successfully treat those of the more simple kind, as well as to decide when the veterinary surgeon should be sent for, and what had best be done until he arrives. The information necessary for these purposes will be found, carefully classified, in the following treatise, compiled by G. H. C. Wright, LL.B.; edited by F. Tonar, M.R.C.V.S.—third edition, revised and extended by a Fellow of the Royal College of Veterinary Surgeons, who is one of the most experienced and trusted members of the veterinary profession. For the use here of this treatise we are indebted to the proprietor of the 'Farming World.'

SUBJECTS.

[1] Youatt *On the Dog*, 59-64.

HORSES.

DISEASES AFFECTING THE HEAD, EYES, MOUTH, AND NERVOUS SYSTEM.

I.—THE HEAD AND NERVOUS SYSTEM.

Apoplexy or Staggers.

This almost hopeless disease results from an effusion of blood producing pressure on the brain.

Symptoms.—Head carried low. The horse staggers till he falls. Eyes fixed and pupils dilated. Muzzle cold. Hearing and sight affected. Teeth clenched. When convulsions come on, the horse soon dies.

Cause.—Apparently the breaking of a small blood-vessel on or near the brain, occasioned by the derangement of the system from overfeeding, or by violence.

Prevention.—There is practically no means of prevention beyond the ordinary proper management of the animal.

Treatment.—Apply ice, or cold water in a douche or stream along the spine and on the back of the head. Give a physic ball (No. 17). Remove dung from lower intestines with the hand. Administer a warm glyster (No. 13) two or three times a-day, and if it can be done without disturbing the animal too much, give the following every four hours: Bromide of potassium, 4 drs.; brandy, 6 oz.; water, 8 oz. But perfect quietness is the best medicine. Nothing more can be done: this almost invariably fatal disease must be left to take its course.

Tumours on or in the Brain

can seldom, if ever, be recognised and localised during life, and their treatment is practically hopeless.

Brain-fever or Mad Staggers, or Inflammation of the Brain.

Symptoms.—Sleepy and daft condition. Nostrils distended. Flanks heaving. Eye wild. When delirium comes on, the horse becomes violent and dangerous; his struggles will continue till he is exhausted, and the stupor returns.

This disease is sometimes thought to

be colic; the difference is, however, very apparent. In colic, the horse is conscious, and only plunges and rolls from pain, often turning his head round to his flanks; in mad staggers the struggles are more violent, and consciousness is lost.

Cause.—Fulness of blood to the head through being over-heated in hot weather.

Treatment.—This disease is so often fatal, and so little can be done to check it by medicine, that bleeding seems the only course to pursue.

Put the horse in a cool stable. Open the jugular vein of the neck, and bleed till he is weak.

Give purgative—croton-nut, ½ dr., or croton-oil, 20 drops, in warm gruel, and repeat in 10 gr. or croton-oil 10-drop doses every eight hours till the bowels are open.

Bathe head with iced or cold water. Inject warm soap-and-water. After purgative has been administered, give every few hours, in gruel, a draught containing chloral hydrate, 4 drs.; bromide of potassium, 4 drs.; Fleming's tincture of aconite, 5 drops; spirit of chloroform, 1 oz.

When recovering, feed moderately for a few days on bran-mashes and a little hay.

Epilepsy or Fits.

A disease on the brain not very common among horses.

Symptoms.—Attack is sudden. Horse stares round, trembles, and falls to the ground. Convulsions more or less severe follow.

When consciousness returns, the horse will feed as if nothing had happened.

Cause.—A derangement of the brain; but very little is known about it, and there are no known means of prevention or cure.

A horse subject to these fits is dangerous for either riding or driving.

Treatment.—Give a purgative (No. 17), and if the horse is restless or excitable give a draught composed of chloral hydrate, 4 drs.; tincture of belladonna, 1 oz.; water, 8 oz., morning and evening; but little can be done to guard against a return of this disease.

Fits, see *Epilepsy, supra.*

Fracture of the Skull.

The bones of the skull are so thick that a fracture can only arise from a fall when a horse rears, or else from brutal violence. This is a common occurrence with pit ponies, and is caused by their knocking their heads against the roof timbers. In most pits they wear a leather skull-cap to prevent this. It is generally fatal.

Treatment.—The parts should be elevated and fastened with adhesive plasters, to prevent their moving. To reduce any inflammation, give purgative (No. 18) and a spare diet.

Fracture of the Nose

is caused by a fall or a blow with a stick across the bones of the nose.

Treatment.—Place the finger up the nose, and gently push the bones back into their place, and retain them there by an adhesive plaster.

Fracture of the Jaw.

Generally caused by a kick, fall, or accidental violence.

Treatment.—If the animal is of any value, get the jaw set by a veterinary surgeon, who will place it in a cradle made for that purpose.

Lockjaw or Tetanus.

A disease affecting the nervous system, and one of the most fatal which attacks the horse.

Symptoms.—A difficulty in chewing its food and some stiffness about the jaws is often the first symptom observable. Water is gulped down, the jaw becomes rigid, and saliva runs from the mouth. Afterwards the muscles of the head, neck, and shoulders become fixed, till the whole muscular system of the body seems cramped. After some days, if the disease is not checked, the horse will die in agony from sheer exhaustion.

Cause.—It is now believed by many to be contagious; but the apparent cause is generally some wound, kick, or blow. Docking has been known to cause it. In some cases the only apparent cause has been the existence of bot-worms in the stomach. Exposure to cold and general neglect have also brought it on.

Prevention.—There is no particular

means of prevention beyond the proper care of the animal; but if the beginning of this disease is suspected, give at once linseed-oil, 1 pint; aloes, 2 drs.; Fleming's tincture of aconite, 8 drops.

Treatment.—In this disease there is considerable difficulty in giving remedies, owing to the contraction of the muscles of the jaws and the general stiffness. If the cause of the disease is some wound, it had better be poulticed, and dressed with carbolic oil or carbolic acid in 20 parts of water. Open the bowels by giving ½ dr. of powdered croton (or 20 drops croton-oil) in warm water, repeating the powdered croton in doses of 10 grs. (or croton-oil 10 drops) every eight hours till purging commences. If costiveness still continues, administer a glyster of olive-oil, 8 oz.; opium, ¼ oz.; warm gruel, 2 quarts.

Put the horse in a cool rather dark stable where there is plenty of air, keep him very quiet, and let no one but the attendant have anything to do with him. Mix an ounce each of extract of belladonna and bromide of potassium together, and place a piece of it about the size of a bean between the molar teeth every five hours by the aid of the forefinger.

Put a pail of gruel or sloppy mash in the manger, so that the animal can, if inclined, partake of it.

Never try to force food down the animal's throat: it only aggravates the disease.

A veterinary surgeon, if called in, would probably inject hypodermically, every four hours, atropine or morphia.

Tetanus does not extend to the internal organs; the horse will suffer from hunger. When the horse is recovering, he should be fed moderately with nourishing food (bran-mashes, linseed, and oatmeal in preference), and he will be all the better for a turn or walk out of doors if the weather is suitable.

If you wish to save your horse, avoid bleeding, so often recommended for this disease. To weaken the vital power at the moment when nature requires the greatest vitality and strength appears to be suicidal. I am not an advocate for bleeding in any disease, except brain-fever, and I think in a few years the practice will altogether die out, as it has done in the medical profession.

Madness or Rabies.

This is the most fearful disease which affects the nervous system.

Symptoms.—Horse suddenly stops, paws the ground, trembles, staggers, and falls; he will rise and once more fall.

Saliva flows from his mouth.

After a short time he springs up in a violent manner, kicking and biting anything near. Fit will succeed fit till he dies. But the symptoms do not always come on suddenly, and for a day, or even more, the attendant may wonder what is the matter with his horse that he is so extremely sensitive to noises, movements, and even to changes of light.

The animal rarely lingers more than three days.

Cause.—The bite of a mad animal, or inoculation with the virus by some other means.

Prevention.—Among veterinary surgeons, there is practically no means of preventing an attack of madness, if the germs or microbes of the disease are once implanted in the blood. A bite from a mad dog should be immediately cauterised with the hot iron, and if four months pass without illness the horse may be considered safe.

Treatment.—M. Pasteur, of Paris, claims to have discovered a remedy for, and preventive against, madness, which he has applied with more or less success in the cases of human beings. But in lower animals, when the dangerous nature of the disease is recognised, the sooner the animal is put out of its misery and beyond the risk of harming its attendants the better.

Megrims.

This disease is said to be caused by an undue pressure of blood in the head.

Symptoms.—The horse will suddenly stop, shake his head, and proceed on his journey, at considerable speed. Sometimes he will turn round twice, or, more often, perspiring profusely, fall down, and either struggle on the ground, or lie quietly. The attack may last five minutes, and when it is over, the horse will resume work as though nothing had happened; he will, however, be considerably weakened. A horse subject

to these attacks is particularly dangerous to ride or drive; and after one attack will always be liable to others in the future. Sometimes horses will die instantly when seized with an attack.

Cause. — Violent exertion in hot weather; too small a collar or tight bearing-rein; a high system of feeding.

Prevention.—A proper-fitting collar and not too violent exercise; a judicious system of feeding, and an occasional dose of purgative medicine, such as No. 20.

Treatment.—Bleeding is of little use, though recommended by many authorities. Let the animal stand a few minutes, dash cold water on his head, push the collar forward, and proceed home as quietly as possible. Then give a physic ball (No. 17), and every six hours in water bromide potassium, ½ oz., for two or three days; afterwards give tonic (No. 21). Mashes and green meat should be given in preference to dry food, and a run out to grass for two months.

Palsy (Paralysis).

A deficiency in nervous power, which affects usually the hind quarters.

Symptoms.—Stiffness in their action, difficulty in turning, disinclination to lie down from the difficulty in rising again, and sometimes a total inability to rise.

Cause.—Pressure on the spinal cord from effusion of blood or serum, or from tumours within the spinal canal. Falls, injury to the spine from blows or from turning in too narrow a stable, old age, and heavy loads.

Prevention.—Humane treatment and ordinary care.

Treatment.—Give mild doses of purgative medicine, such as linseed-oil, 1 pint; which will not only open the bowels, but also support the system. Rub stimulating embrocation, as mustard liniment (No 15), on the part affected, and in cases of doubt, especially along the spine. Give morning and evening nux vomica tincture, 2 drs.; spirit of ammonia, 1 oz., in 10 oz. of water.

Rabies, see *Madness* (p. 444).

Stomach Staggers.

Oppression on the brain resulting from a deranged and distended stomach.

Symptoms.—The first symptom may be dull, colicky pains, sleepy look, pulse very slow, profuse perspiration. In many cases blindness. Rests his head against the manger or wall, and sometimes moves his legs in a peculiar manner. Staggering gait till the horse falls down and dies in a state of stupor.

Cause.—Unsuitable or over feeding. Food in an overloaded stomach will swell and distend it, producing an oppression on the brain which causes staggers.

Prevention. — Proper, regular, and systematic feeding with food of good quality will ensure immunity from this disease.

Treatment.—Give a purgative medicine, such as 1 pint linseed-oil and 1 oz. of tincture of ginger. An hour after the dose of oil give in gruel draught (No. 9), and repeat the dose of oil if action of the bowels is not obtained. Glysters of warm soap-and-water should also be given every four hours.

Grass Staggers.

A disease of the nervous system arising from the stomach.

Symptoms.—They come on slowly, the horse is dull and listless at first, but gradually passes into a somnolent condition. In time the animal gets weak, reels, or staggers about, and if sharply turned, will most likely fall down. It seldom lies down when suffering from this disease.

Cause.—It is mostly seen during the months of July and August, but varies according to the season. It arises from eating rye-grass at a certain stage of its growth, as if eaten in this state it causes the disease. In hot and dry seasons it is most frequent.

Treatment.—Remove the animal into a loose-box, give ball (17) and draught (9), and repeat the draught every four hours. Do not give any more rye-grass, but steamed oats, bran-mashes, and a little hay. Fresh, succulent, natural grasses may be given in very small quantities.

II.—THE EYE.

Cataract

is an opacity of the crystalline lens, and often follows an attack of ophthalmia.

Symptoms.—A whitish speck in the eye, which varies in different eyes in shape, position, and size. They sometimes become large enough to cause blindness.

Cause.—From a blow, after an attack of ophthalmia, or inflammation of the eye.

Treatment.—In the lower animals very little can be done for it.

Glass Eye.

Paralysis or loss of special sensation in the optic nerve.

Symptoms.—The eye looks larger, pupil dilated, animal stares—in fact, the eye is blind and motionless, and looks more like a glass eye than a natural one.

Cause.—It is seen as a temporary condition in some cases of poisoning, but when permanent it is the result of either partial or total loss of function in the optic nerve.

Treatment is of no use unless it is the effect of a poison, then give ball (17), a pint of linseed-oil, and every two hours give in pint of cold water 4 oz. of brandy and 2 oz. of spirits of ammonia aromat.

Inflammation of the Eye, or Simple Ophthalmia.

Symptoms.—Eyelids swollen, watering, and nearly closed. Eye bloodshot, and inside of the eyelids very red. Cornea cloudy. Health not affected.

Cause.—Foreign matter, such as a hay-seed or chaff in the eye; a blow with a whip; or, more generally, cold. It is sometimes produced in a young horse by over-exercise.

Treatment.—First remove any foreign substance. Give mild purgative (No. 20), and a mash diet; bathe the eye with poppy-heads and warm water every two hours, and if that is not handy, with weak brandy-and-water; if no improvement, bathe with a solution composed of liquor *opium sedativus* 1 oz., in 1 pint of cold water. A useful lotion for inflammation of the eye is, sulphate atropine, 4 grs., in 1 oz. of water. Keep the animal in a dark box until better. The inflammation should be cured in a few days; if not, treat as for Ophthalmia, *infra*.

Itching or Tumour of the Eyelids.

Treatment.—Rub the eyelids with mercurial ointment and lard in equal parts, and give sulphur, ½ oz., and nitre, 1 dr., in the food once a-day till the animal is cured.

Removal of the Eyeball.

It is necessary sometimes, when the eye has been severely damaged, or has a cancerous growth in it, to remove it. This can be done only by a veterinary surgeon, who will not only remove the eye, but, if you wish, place a glass one in its place. In using glass eyes always take them out at night, for if kept in very long they become painful.

Ophthalmia.

Violent inflammation of the eyelids, extending to the cornea and internal structures of the eye.

Symptoms.—Light pains the eye, which is kept shut; a profuse flow of tears. Pupil is contracted, and iris changes colour. The opacity usually extends from the circumference towards the centre, and the inflammation diminishes one day to increase twofold the next, till in a few weeks, if not checked, the eye becomes opaque and blindness comes on. After an apparent cure the disease will sometimes come on again, either in the same eye or in the other which had not previously been affected.

Cause.—A foul-smelling, ill-ventilated stable, reeking with ammonia and decomposing manure, is a frequent cause of this disease. Confinement in a dark stable and a sudden transition into the glaring sunshine often accounts for it. The tendency to inherit this disease from sires with defective sight is too well known from sad experience to need any comment. The management of horses being now better understood, this disease is becoming rarer every day.

Prevention.—A well drained and lighted stable and cleanliness are the best preventives.

Treatment.—Foment the eye with warm water, and bathe with a lotion composed of sulphate of atropine, 4 grs., in 1 oz. of water. Feed on spare diet; put the horse in a cool, airy, but dark

stable, where there is perfect cleanliness. Give purgative (No. 18 or 19). The use of the lancet may in extreme cases be useful; the inside of the eyelid should be exposed, and the lancet drawn lightly along for the purpose of relieving the parts affected by pressure of blood. Cloudiness of the eye, or complete opacity, is a frequent consequence of this disease, which may be treated by bathing with solution of corrosive sublimate, 1 gr., in 2 oz. of water.

Thickening of the Haw.

The haw of the eye is situated in the inner corner of the eye filling the lid. A horse can bring it forward over the eye, and with it wipe away any foreign matter that may have got into it. This haw sometimes enlarges and protrudes, so that it cannot retract.

Treatment.—Give purgative (No. 19), and bathe the eye with poppy-heads and warm water. Should the ulceration continue, bathe with white vitriol, ½ dr.; water, 6 oz.; or paint with a weak solution of silver nitrate. If further treatment is necessary, it must be left to a veterinary surgeon.

Warts on the Eyelids.

Treatment.—Cut off with a pair of scissors and touch with lunar caustic, taking care not to touch the eye, and not to put on more than is necessary. Rubbing the roots with blue vitriol will sometimes effect a cure. Take care also that any bleeding, when cutting, does not touch any other part, as blood from a wart may spread the disease.

Wounds in the Eye or Eyelids.

Generally caused by brutality or carelessness.

Treatment.—Very little can be done except to reduce the inflammation by purgative medicine (No. 20), and bathe with warm water, and apply a lotion composed of atropine, 4 grs., in 1 oz. of water. This lotion is best applied by the aid of a feather, which, when soaked in the lotion, should be drawn gently across the eye. When the eyelids are torn, never cut any of the skin off, but retain it in its proper position by the aid of silver wire. In these cases the horse should be kept in a dark box.

III.—MOUTH, NOSE, TEETH, TONGUE, PALATE.

Glanders,

or enlargement and ulceration of the glands in the lower jaw.

Symptoms.—Small discharge of glutinous matter from the nose, generally from one nostril, and that the left, but no cough. Swelling of the glands beneath the lower jaw, which afterwards subsides, leaving the glands more fixed to the side of the jaw. Mucous membrane of the nose becomes purple instead of red, owing to inflammation. Lastly, pus-discharging ulcers appear in the nostrils, accompanied by cough, failing appetite, weakness, and staring coat; these ulcers increase in number till they finally extend to the lungs, when death is certain. This disease may at first be confounded with Strangles (see p. 448): the difference, however, between the two diseases is well marked. In strangles the membrane of the nose is red, the discharge from the nose profuse; there is cough and sore throat, besides a swelling of the glands on both sides of the throat. The opinion of a veterinary surgeon should always be obtained should glanders be suspected.

Cause.—Unhealthy stable, want of fresh air, improper management, and contagion, are the most frequent causes of this disease.

Prevention.—Do not run any possible risk of contagion. See that there is good ventilation and cleanliness in the stable, combined with judicious and proper management of the animal.

Treatment.—Completely isolate from other horses. When once glanders is declared by the veterinary surgeon, the sooner the horse is destroyed the better; there is no recognised and practicable cure, and the danger of its being spread by contagion is so great as to make it safer to destroy the animal at once. Notice must be immediately given to the police, as it is included under the Contagious Diseases (Animals) Acts.

Lampas.

A fulness of the lower bars of the palate.

Cause.—It generally occurs with

young horses, and is a natural result from the congestion caused by the shedding of their milk-teeth and the growth of the permanent ones.

Treatment.—Cut the bars lightly with a penknife several times across, avoiding the artery. Never burn them. Give bicarbonate of potash, 6 drs., morning and evening in drinking-water, and warm bran-mashes. Use lotion (No. 16) for washing the sore places.

Nasal Gleet.

A profuse and unnatural discharge of mucus from one or both nostrils.

Symptoms.—The nasal discharge continues after every other sign of cold has left. Mucus in large quantities, mingled with matter, constantly flows or is blown from the nose, till the horse becomes much weakened. Every care should be taken to make certain that it is not a case of glanders.

Treatment. — Should cough remain, treat as for Cough (p. 450). If the discharge is fœtid, give daily a dose containing sulphate copper, 1 dr.; ginger, 2 drs.; gentian, 2 drs. If the discharge is not offensive, but only an excessive discharge of the fluid which moistens the nose, give daily, sulphate copper, 1 dr., made into a ball with flour and treacle. Horses affected by this complaint should always have a lump of rock-salt in their racks, and a little salt mixed with the most nourishing food possible. Tonic (No. 21) may be useful in treating this disease. Nasal gleet of long standing is mostly due to a diseased tooth or bone in the head, which must be removed to effect a cure.

Polypus.

An excrescence growing in the nostril which impedes the breathing. It must be removed by a veterinary surgeon, and no treatment by an unprofessional man can be of any use.

Bleeding from Nose.

The result of irritation of the nose, glanders, bursting of a blood-vessel in the head or lungs, and sometimes a blow on the head.

Treatment.—Keep animal quiet, head elevated, and pour cold water over it. Give every two hours, in a pint of gruel, tincture of perchloride of iron, 1 oz.; spirits of sweet nitre, 2 oz.

Strangles.

A disease more common among horses under four years old than among older ones.

Symptoms. — A cold, cough, sore throat, and profuse discharge of yellow mucus from the nostrils, swelling under the throat, which increases and renders swallowing painful. The tumour is situated in the centre of the throat under the jaw, and feels like one solid mass. Owing to its solidity this disease can readily be distinguished from Glanders (see p. 447) when the tumour is composed of separate parts, which can be easily identified. The centre of the tumour is soft, and when it bursts it discharges an immense quantity of pus, quickly healing after the discharge. When the cough subsides, the horse begins to recover from the extreme weakness attending this disease.

Cause.—Probably cold or climatic changes. I have strong reasons for believing that this disease is contagious, though this opinion is doubted by many authorities.

Prevention.—None.

Treatment.—Blister the tumour with ordinary blister (No. 1 or 2) to hasten its progress and prevent the inflammation spreading. When the tumour is soft on the top, lance it and suffer the pus to drain out without any pressure. After the discharge, keep the place clean by bathing it well with warm water; rub with vaseline, which will soften the wound and promote its healing. Give twice daily, in a pint of gruel, No. 9, and keep the bowels open with carrots and bran-mashes. Feed on bran-mashes and green food, and keep the animal in a cool and comfortable stable. When recovery is established, give morning and night tonic (No. 21), and keep the horse well. The discharge from the nose will continue some time, but will gradually cease. If this disease is neglected, death will probably follow.

Bastard Strangles.

A low form of strangles, in which abscesses appear on different parts of the body. The treatment should be the

same as for ordinary strangles. In this disease there is much more danger of blood-poisoning.

Teeth (Diseases of).

The irregular growth and rough edges of the teeth frequently produce wounds in the mouth. A horse out of condition should be examined, and if his teeth are irregular or have rough edges, they should be rasped down with a file that is made for the purpose. Sometimes it is necessary to cut off part of a tooth which projects far above the level of the others.

Extracting Teeth.

To extract the corner teeth of a three or four year-old horse, so as to try and alter his age, is cruel, and any one with experience of horses can easily see on looking into the animal's mouth if such a thing has been done.

Wolf-teeth.—These little teeth are situated in front of the molars, and are believed by some to interfere with the animal's feeding. They can be easily extracted by the aid of a pair of forceps, or else punched out. But unless it is distinctly evident that they are causing trouble, they should be left alone.

Molar Teeth.—They sometimes become diseased. The animal quids his food, and frequently when feeding pauses for a few seconds. The breath is very offensive. Their treatment should certainly be left to the veterinary surgeon.

Wounds in the Mouth.

From a cruel bit, &c.

Treatment.—Wash it with a solution of alum, 1 oz., dissolved in twenty-eight times its weight of water; or use lotion (No. 16).

Teething Cough.

A persistent and violent cough.

Symptoms.—Usually seen between the age of three and four. Food refused, head poked out, gums red and swollen, frequent coughing, and sometimes a tooth is found in the manger.

Cause.—Teething, which causes irritation of throat.

Treatment.—Extract any temporary teeth showing signs of getting loose, and blister throat with mustard liniment (No. 15), and give every night and morning, in a pint of gruel, draught (No. 16).

Wounds of Tongue.

Treat as for wounds of the mouth.

Tongue Bladders.

Sometimes occur underneath the tongue.

Cause.—Produced by a slight derangement of the system.

Treatment.—Give a physic ball (Nos. 17 or 18), which will reduce any fever. The bladders may be readily removed by opening with a lancet.

Paralysis of the Tongue.

Palsy of the tongue.

Symptoms.—The tongue hangs in a loose manner from the mouth, and becomes swollen and inflamed.

Cause.—A severe injury to tongue, or by dragging on the tongue when giving a ball.

Treatment.—Suspend the tongue in a loose bag tied to the head-stall; give purgative (No. 19) and a drachm of nux vomica night and morning in a half-pint of water.

Amputation of Tongue.

This is sometimes done by veterinary surgeons when the tongue has been extensively lacerated. A horse that has lost part of his tongue must be fed from a deep manger, and in drinking these animals force their heads deeply into a pail of water.

Paralysis of the Lower Lip.

A pendulous condition of the lower lip.

Symptoms.—The animal's health is not interfered with, and he feeds fairly well, but lets a little food drop, his lip hangs down, and a little saliva flows from it.

Cause.—Paralysis of the nerve of the lip, which is usually brought about by the curb-chain being too tight, or a badly fitted bridle.

Treatment.—Give a physic ball, containing 5 drs. of aloes, and rub into the lip and sides of the face a little of embrocation (No. 12). Feed on sloppy mashes.

DISEASES AFFECTING THE THROAT, CHEST, RESPIRATORY ORGANS, AND BLOOD.

Bronchitis,

or inflammation of the bronchial tubes.

Symptoms. — Coughing, wheezing, hard breathing, and weakness. The horse may die in a severe attack from suffocation.

Cause.—In cases of neglected cold or catarrh, bronchitis often follows. Exposure to cold or wet.

Treatment.—Give plenty of fresh air, but keep warm. Apply embrocation (No. 12) to the chest; give nitre, 3 drs., and Fleming's tincture of aconite, 10 drops, three times a-day, and increase the dose if necessary. Feed on bran-mashes containing linseed-meal. For drinking-water, give weak infusion of linseed. In acute cases, give in gruel draught No. 10 three times a-day.

Broken Wind.

Symptoms.—In this disease the expiration of the breath takes two efforts, and the inspiration only one; the breathing, therefore, is not regular, as in thick wind.

Cause.—It is the rupture of air-cells, and is generally attended by a dry cough. Gross feeding, previous inflammation, and violent exercise after heavy feeding.

Treatment.—There is no *cure*. Keep for slow work, and feed on soft nourishing food which occupies a small space.

Crib-biting

is more of a habit than a disease.

Symptoms.—The animal seizes the manger or any fixed object, and makes a gulping noise as if trying to swallow air.

Cause.—Indigestion or habit; one horse will learn it from another.

Treatment.—It takes a lot of curing. Anchovy paste on the manger will sometimes effect a cure. Any saddler will make a strap to go round the horse's neck to prevent crib-biting. An invention has been recently brought out to cure it by the aid of electricity. The battery is placed in such a way, that whenever the animal seizes and squeezes the top part of the manger, he at once receives a severe shock.

Choking.

Substances which have lodged in the gullet can generally be forced down by the use of a flexible tube, similar to that used for cattle; if not, an operation by a veterinary surgeon will be necessary.

Sore Throat.

A common complaint, and associated with such diseases as strangles, influenza, and scarlet fever, &c.

Symptoms. — Animal has a nasty cough, quids his food, and pokes out his nose.

Treatment.—Blister the throat with embrocation (No. 12), feed on sloppy food, and give in gruel twice a-day (No. 10). Be careful in drenching that you do not choke the animal, for you are very liable to do so when it is suffering from a sore throat.

Rheumatic Fever.

A specific fever due to a constitutional condition of the system.

Symptoms.—Animal restless, breathing hurried, slight cough, shows signs of pain, goes stiff, and joints swell.

Cause. — Hereditary tendency, bad stables, and insufficient food.

Treatment. — Give physic ball (No. 20), put an ounce of nitre frequently in drinking-water, and give twice a-day the following ball: iodide of potassium, 1 dr.; powdered colchicum, 20 grs.; liquorice-powder, 2 drs., made up with linseed-meal and treacle. Rub the swollen joints every night with embrocation (No. 12).

Chronic Cough.

A most annoying disease to the rider. This cough frequently follows an attack of inflammation of the lungs.

Symptoms.—If the horse coughs after drinking, the cough will arise from the windpipe. It does not affect the general health.

Cause. — Previous inflammation, neglected cold, and sometimes worms.

Treatment.—If the coat is staring, the cause of the cough will generally be worms, in which case give turpentine, ½ oz., daily, in 4 oz. of linseed-oil; or santonine, 20 grs., and aloes, 3 drs., made into a ball with linseed-meal and treacle, in the morning on an empty stomach.

and repeat after two days; or give draught (No. 11). If the cough proceeds from the throat, feed on green meat and mashes, and give ball (No. 8). Apply blister (No. 2) to the throat if other remedies fail. Water, in which a little linseed or treacle has been boiled, is useful instead of plain water, for drinking purposes.

Common Cold.

Symptoms. — Slight discharge from the nose, and weeping of the eyes; fever and cough.

Cause.—Changes of temperature and chills.

Treatment. — Clothe warmly, and place in a cool stable. Feed on warm bran-mashes with a little linseed-meal in them, and give in gruel night and morning till fever is reduced — acetate of ammonium, 3 oz.; potassium bicarbonate, ½ oz.; chloroform, ½ oz.; and apply liniment (No. 14) to the throat, or embrocation (No. 12).

Distemper, Catarrhal Fever, or Influenza.

Most prevalent in spring and autumn, especially when the weather is cold and wet.

Symptoms.—At first dulness, loss of appetite, and there may be shivering, cough, weakness, inflamed eyes, nose a pale red, watery discharge from nostrils. Later the discharge from the nostrils becomes thick, but seldom offensive, glands of throat and under jaw swell, which make swallowing difficult. Generally there is intense weakness.

There is a violent form of influenza which has lately come into notice called "pink eye." It is attended with extreme weakness, depression, and loss of appetite, and has been the cause of serious loss in many parts of the country.

Cause.—Contagion, influences of climate producing cold, amounting almost to an epidemic.

Treatment.—Remove into a cool box, clothe warmly, feed on warm bran-mashes (the steam from which is very beneficial) and green food, a little hay, or a carrot or two, and give in weak infusion of linseed 1 oz. nitre, instead of pure water for drinking. Sponge the nostrils with vinegar and water. Give draught twice a-day containing spirit nitrous ether, 1 oz., liquor *ammonia acetatis*, 3 oz., in a pint of water, and rub the throat with embrocation (No. 12). Half fill a nose-bag with hay, and pour boiling water upon it, and keep the horse's head in it till it ceases to steam, but be careful not to burn the horse's nose. In cases of extreme depression, as in pink eye, give every three hours spirit nitrous ether, 1 oz.; whiskey, 4 oz.; water, 6 oz. Charcoal-powders night and morning are useful for improving the blood. When recovering, give tonic (No. 21) in a pint of beer twice a-day. Great care should be taken to prevent these attacks producing roaring and other diseases.

Broken Ribs.

The ribs of horses are frequently broken through accidents and kicks.

Treatment. — If the ribs are only broken and not the skin, put a good pitch-plaster over that side of the chest; but if the skin is broken and there is a hole in the chest, it is beyond the power of any one but a veterinary surgeon to effect a cure.

Dropsy of the Chest.

The result usually of pleurisy.

Symptoms can be detected only by placing the ear against the chest.

Treatment.—Tap the chest and let the fluid out.

There is a disease amongst colts running on low marshy land of a dropsical nature, but in this disease the swelling is seen on the outside of the chest and along the abdomen.

Treatment.—Take colt in from the grass, give good food, and every night and morning, in a pint of gruel, give tonic (No. 21).

Farcy.

A glanderous ulceration which first affects the superficial lymphatics or glands.

Symptoms.—Small tumours or cords which follow the track of the lymphatic vessels; they increase in number and at length ulcerate. Fœtid discharge from nostrils. Swelling round muzzle and of the limbs, which sometimes increase to an enormous size; at other times the heels crack and mangy eruptions cover the body. There are various forms of

this disease, and the aid of a veterinary surgeon should always be obtained. It is included in the Contagious Diseases (Animals) Acts along with glanders, and notice must be at once given to the police.

Cause.—Bad ventilation and sanitary arrangements; neglect of proper exercise and cleanliness; contagion.

Prevention.—None beyond proper management.

Treatment.—Remove into a clean, cool, well-ventilated box, and isolate from other horses. Give opening medicine, corrosive sublimate, 8 grs.; gentian 2 drs; ginger, 2 drs., every night; increase the dose of sublimate gradually till 1 scruple is given. Should the mouth become sore, give daily sulphate of copper, 1 dr., and powdered aniseed, 1 oz. If the horse is too violently purged, give a ball containing opium, 1 dr., mixed with meal and treacle. Cauterise the ulcerated buds with red iodide of mercury ointment (No. 4). If the cauterised places do not look firm, bathe with lotion containing corrosive sublimate, 1 dr.; rectified spirits of wine, 4 oz. When the buds become healthy, apply friars' balsam to heal them. The horse should be fed on green meat and carrots, and, should the season permit, a run out of doors for a few hours in the middle of the day will be beneficial. Rock-salt should always be placed in the rack. If limbs are greatly swollen, foment frequently with hot water.

Anthrax or Splenic Fever

is a blood disease of a virulent type.

Symptoms.—The animal suddenly becomes ill, perhaps during work; violent trembling, excessive perspiration, hurried breathing; the animal reels, loses the power of his legs, and, after a few convulsions, becomes unconscious and dies. In some cases the symptoms are not so pronounced at first, the animal only sweating, going stiff, trembling, and extremely dull; and if it lives over the first twelve hours, there is generally extensive swelling of the throat, often spreading down the under part of the neck toward the chest, and a sticky straw-coloured fluid trickling from the nostrils. But it gradually gets worse, and in a few days will probably die.

Cause.—The chief cause is contagion, through the animal receiving into its system the germ which causes the disease—the *Bacillus anthracis*. This it is most likely to do in its food or water, or it may be into a scratch or wound. The *Bacillus anthracis* is a rose-like vegetable organism which grows and multiplies in the blood with great rapidity. The disease is mostly seen in low-lying lands and near stagnant pools. Dogs, birds, vermin, and flies are propagators of it through feeding on diseased carcasses.

Prevention.—Drain the land, run off any stagnant pools. Bury the diseased carcasses 8 to 10 feet deep, and throw oil of vitriol and quicklime over them. Be careful you do not infect yourself through handling these carcasses, and do not allow any more animals to graze on the land that has caused the disease until it has had a good dressing of lime.

Treatment is very unsatisfactory, although the disease is not necessarily fatal. Give purgative (No. 17) and carbolic acid in half-drachm doses, in a pint of water, every five or six hours; or alternate it with salicylic acid in half-ounce doses in gruel. Give also stimulants occasionally; in this case turpentine in ounce-and-half doses is perhaps the best, given in thin gruel; and administer salines, as nitrate of potash in half-ounce doses, and chlorate of potash in 2-drachm doses,—the purpose being to get the system rapidly saturated with substances inimical to the life of the bacterium.

The greatest care should be exercised in treating and attending to the animal, as the attendants have sometimes become fatally affected by receiving the contagion from the animal under their care.

Simple Fever.

Symptoms.—Staring coat, cold legs and feet, dulness, alternate shivering and hot fits, constipation. There is no cough or turning round to the flanks.

Cause.—Sudden change from heat to cold, often produced by the improper ventilation of a stable; checked perspiration.

Treatment.—Place in a cool stable where there is good air without draught, and give soft food while the fever is at its height, and then a more generous

diet. Give mild opening medicine, such as linseed-oil, ½ pint. On no account give active purgatives. Glysters of warm soap-and-water will aid the action of the bowels, and give every four hours a draught containing solution acetate of ammonium, 3 oz.; Fleming's tincture of aconite, 5 drops; spirit nitrous ether, 1½ oz., in pint of water. The disease is not dangerous, unless complications ensue.

Bleeding

is gradually becoming a thing of the past, but it is sometimes beneficial, especially where there is great blood-pressure, such as brain-fever, mad staggers, and acute founder.

How to Bleed an Animal.—Put a driving bridle on the horse, bring his head round to the light, turn it to the left side, raise the jugular vein on the right side by pressing on it with the fingers, hold the fleam in the left hand parallel with the vein, and give it a smart blow with the blood-stick; keep the bucket pressed against the neck below the wound, and if the blood does not flow freely, insert the fingers into the mouth to keep the jaw moving. Take from 1 to 3 quarts of blood, afterwards place a pin through the lips of the wound, and wind tow around it. Do not use too large a fleam.

Inflammation of the Jugular Vein after Bleeding.

The wound caused by bleeding is generally held together by a pin and piece of twisted tow; it will usually heal in a couple of days. If the fleam has been carelessly used, or has been dirty, the wound is apt to become inflamed, swell, and discharge matter. Abscesses will then form, and if not checked will prove dangerous.

Treatment.—Inject a weak solution of nitrate of silver into the abscesses; wash the wound at once with a solution of carbolic acid, containing about 20 parts of water, and if this does not prevent the abscesses forming, further treatment must be left to the veterinary surgeon.

Purpura, or Purpura-hæmorrhagica.

A blood disease of a very low type.

Symptoms.—Is seen frequently after severe illnesses. The legs, nose, and lips swell, pink spots are seen inside nose and eyelids; animal refuses food, and looks a pitiful object.

Cause.—Sequel to other diseases, or from bad stable drainage.

Prevention.—See that your stable drainage and food are good.

Treatment.—Is best left to a veterinary surgeon.

Inflammation of the Lungs, or Pneumonia.

Symptoms.—Fever and quickening pulse, cold ears and legs, breathing thick, nostrils dilated, restlessness, unwillingness to lie down, and staring coat. Sometimes the attack comes on suddenly and sometimes gradually. Death has been known to ensue in twelve hours.

Cause.—Cold, over-driving when out of condition.

Treatment.—Remove to a cool airy loose-box, and clothe warmly; rub the legs well, using white oil liniment (No. 14); feed on green meat and bran-mashes only; apply embrocation (No. 12) to each side of the chest; give every four hours a draught containing acetate of ammonium, 3 oz.; bicarbonate potash, ½ oz.; Fleming's tincture of aconite, 3 drops; water, 8 oz., till the fever is subdued. When recovering, give tonic (No. 21), and two months' run at grass if the season permit.

This is a very dangerous disease, and the aid of a veterinary surgeon should be obtained.

While suffering from fever the diet should be sparing, and entirely composed of green meat, carrots, and cold bran-mashes. The open air is preferable to a close warm stable: it is of the first importance that the horse should have cool fresh air to breathe. If this disease is neglected, the after-consequences, even should the horse recover, will be most serious, and his constitution will be ruined.

Scarlet Fever.

A feverish disease of the horse, characterised by pink spots in the nose and mouth, and usually associated with a sore throat.

Symptoms.—The animal dull and off its feed, eyes swollen, pink spots inside

the nose and eyelids; there is sometimes a sore throat.

Treatment.—Place the animal into a comfortable loose-box, give thrice a-day, in gruel, draught (No. 9), and when recovering, give tonic (No. 21) in a pint of ale twice a-day.

Pleurisy.

A disease affecting the membrane covering the lungs and lining the chest.

Symptoms.—Very similar to those of inflammation of the lungs, except that the pulse is hard and small, the breathing shorter and painful, and performed mostly by the abdominal muscles, showing a line at each expiration from the lower border of the ribs to the flank.

Cause.—Chills.

Treatment—Remove into a cool airy stable, and feed on cold bran-mashes and green food. Rub the chest and sides with embrocation (No. 12), and give twice a-day oil of turpentine, 1 oz.; iodide of potassium, 2 drs.; linseed-oil, 4 oz.; lime-water, 6 oz. Call in a veterinary surgeon, who may resort to the use of the trocar to puncture the chest. Complete rest at grass, if possible, and tonic (No. 21) should follow when the animal is recovering.

Heart Disease.

A disease causing interference with blood circulation.

Symptoms.—There is really but one true symptom, and that is the irregularity of the pulse, but often associated with this there is weakness, cough, hurried breathing, and sometimes the animal staggers as if in want of breath.

Cause.—Rheumatic usually in its origin.

Treatment.—None.

There are several other inflammatory diseases of the heart, but it would only be wasting time to enumerate them here, for they are of a complicated nature and very rare.

Poll Evil.

A painful swelling on the upper part of the neck behind the ears, generally terminating in an open sore.

Symptoms.—Inflammation and swelling of the ligaments over the atlas bone.

Cause.—Tight reining, blows on the neck and head from striking the manger, or given by a savage attendant.

Treatment.—Apply cooling lotion, such as goulard water, to the swelling, and keep the bowels open with purgative (No. 18). If the tumour increases, apply common blister (No. 3) to hasten its discharge, and when it is soft in the middle it should have a seton drawn through the tumour from the top, through the bottom, out at the side below the tumour: this will completely drain the abscess. Then foment and clean with warm water till cured. The aid of a veterinary surgeon should be obtained to ensure the successful treatment of the tumour.

Roaring.

A disagreeable noise made by some animals during respiration, especially if forced to exert themselves.

Symptoms.—A roaring sound when sharp exercise is taken, caused by the difficulty of the air passing through the contracted opening of the larynx.

Cause.—Frequently results from an attack of strangles. Tight reining tends to produce it.

Treatment—There is no cure in the case of a confirmed roarer. In early stages rub blister (No. 1) on the throat, and give a ball morning and night, composed of nux vomica, ½ dr.; arseniate of iron, 3 grs.; quinetum, 1 dr. Nothing further can be done.

Saddle Galls.

Cause.—A badly fitting saddle.

Treatment.—Apply lotion (No. 7), alter the saddle, and do not work until cured.

Sore Shoulders.

The shoulders of horses sometimes become very sore and painful, and when in this condition, if neglected, large wounds and abscesses soon follow.

Cause.—Badly fitting collar, heavy loads, using one trace longer than the other, and working horses too young.

Treatment.—Bathe the shoulders night and morning for an hour with warm water, then apply lotion (No. 16) to the parts where the skin is broken. Do not work the animals until they are properly healed, for you can be summoned for working a horse with sore shoulders.

Sitfasts.

These are small hard tumours which form in the substance of the skin where the harness comes in contact with it.

Cause. — Pressure of the saddle. Small pimples or pustules from an unhealthy condition of the skin.

Treatment.—Give rest, foment, and apply cooling lotion. Should they suppurate, wash with tincture of myrh, 1 oz.; carbolic acid, ½ oz.; glycerine, 2 oz.; and water, 10 oz. If they make no progress towards healing, apply a little blister (No. 1) to the ulcers, and dress the wounds with friars' balsam. But it is often advisable, and brings about a far more speedy recovery, to have the hard core in the centre carefully removed with the knife. Alter the saddle and make it fit.

Stricture of Gullet.

Symptoms. — A contraction of the gullet which prevents the passage of food. Can be cured only by a veterinary surgeon.

Thick Wind.

Symptoms.—Difficulty of breathing when driven. Short hurried respirations. This complaint is most usual in horses with contracted chests, often resulting from an attack of inflammation of the lungs.

Treatment.—This annoying disease can be mitigated only by careful management, avoiding sharp exercise after feeding, and by never giving a very full meal. The food should be of a very nutritious nature in a small bulk. A thick-winded horse may be able to go a good pace without inconvenience, if he is not hurried when he first leaves the stable.

Whistling and Wheezing

are forms of broken wind, which can be mitigated only by using the animal for slow work. A drink made of linseed-meal, one pint, boiled in six pints of water, with a little treacle, may do good, but there is no cure.

Withers (Fistulous).

Symptoms. — This troublesome disease first appears as a swelling on the withers, develops into a tumour, then into a deep ulcer, which extends down to the bone.

Cause.—Pressure on the withers from an ill-fitting saddle or collar.

Treatment.—Give the horse complete rest till cured; do not work him till then under any pretence. Upon the first appearance of the swelling, foment, and apply lotion (No. 7). If the tumour appears, apply blister (No. 1 or 3). The veterinary surgeon should be called in, if this does not stop the inflammation. Keep the bowels open by feeding on green meat and bran-mashes.

DISEASES AFFECTING THE STOMACH, LIVER, BOWELS, KIDNEYS, AND OTHER INTERNAL ORGANS, AND PARTURITION.

Bots.

The larvæ of the gad-fly. Most common in spring and early summer. The eggs of the gad-fly are deposited among the hair, and are introduced into the stomach through the horse licking himself. They attach themselves to the lining of the stomach during the winter, injuring and weakening it, till finally they are seen escaping in the spring out of the anus, causing great itching.

Treatment.—No medicine will totally destroy these bots. The use of salt among the food may serve to mitigate the evil, and a draught containing oil of turpentine, 1 oz., linseed-oil, 10 oz., may remove many of them, but very little can be done, and nature must be left to take its course.

Colic or Gripes.

1. *Flatulent Colic.*

Symptoms.—Stomach and intestines distended with gas; pain and depression.

Cause.—Overloading of the stomach with green meat; cold and over-exertion.

Treatment.—Give a purgative (No. 17), and glyster (No. 13), and every two hours give a draught containing opium tincture, 1 oz.; spirit of ammonia, 1 oz.; carbolic acid, 15 drops; chloroform, 1 oz., in 12 oz. of water.

2. *Spasmodic Colic.*

Symptoms.—Acute pain, rolling on the ground, suddenness of attack, excited countenance, and the intermittent

nature of the pain. This last characteristic distinguishes the disease from inflammation of the bowels.

Cause. — Chills from drinking cold water when hot, or otherwise.

Treatment.—If taken in time, this disease can usually be cured by giving linseed-oil, 1 pint; and every two hours, in a pint of gruel, a draught containing oil of turpentine, 1 oz.; tincture of opium, 1 oz.; chloroform, 1 oz. Walk the horse about after giving the dose. If the attack continues, apply hot fomentations to the belly till the aid of the veterinary surgeon can be obtained.

Diarrhœa.

Frequent passing of fluid dung.

Symptoms. — Animal dull, refuses food, slight colicky pains, and frequent dunging, which, if not checked, will terminate in inflammation of the mucous membrane of the bowels.

Cause.—Bad feeding, or feeding on raw potatoes, too succulent green food, cold and irritation of the bowels, from worms or innutritious food.

Treatment.—Place animal in a warm box, if cold, put a rug on, keep short of water, and give in half-pint of gruel twice a-day the following: Tincture of catechu, 1 oz.; powdered chalk, ½ oz.; tincture of cardamoms, 1 oz.; opium powder, 1½ dr. To be continued until the diarrhœa ceases.

Constipation.

Generally arising from the nature of the food or torpidity of the liver or intestines.

Prevention.—All dust from chop or chaff should be sifted out of horse's food, and too much mealy or dry food should not be given without access to water.

Treatment. — Give purgative medicine—linseed-oil, 1 pint, and plenty of watery food, gruel, &c., and warm glysters of soap-and-water, repeating the dose of oil when required. For chronic constipation give daily a ball composed of aloes, 1 dr.; nux vomica, ½ dr.; carbonate ammonium, 1 dr.; ginger, 1 dr.; gentian, 1 dr.

Dysentery.

A continual passing of semi-solid dung, tinged with blood.

Symptoms.—It first starts with diarrhœa, which passes into dysentery; the animal becomes restless, occasionally lies down; in the course of a few hours it trembles; clots of blood are passed with the dung, which has a bad smell if not soon checked; a cold sweat breaks out, the legs become cold, the eye glassy, and death closes the scene.

Cause.—Too large a dose of physic, worms and improper feeding, associated with a bad sanitary condition of the stable.

Treatment.—Put animal in a warm box, if cold; put a rug and bandages on. Give every six hours until the purging ceases the following drench in half a pint of gruel: Chlorodyne, ¼ oz.; powdered opium, 1 dr.; prepared chalk, ½ oz.; tincture of cardamoms, 1 oz.; old port wine, ½ pint.

Diabetes.

Symptoms.—Unnatural discharge of urine, weakness, and unthrifty appearance.

Cause.—Irritation of the kidneys by a too frequent use of diuretics or bad food.

Treatment.—Feed on green food and mashes, and give morning and night in gruel a draught containing dilute hydrochloric acid, 2 drs.; quinetum, 1 dr.; tincture of opium, ½ oz. The part of the loins over the bladder should be covered with a hot cloth. Attend to the quality of the food, and in severe cases call in a veterinary surgeon.

Inflammation of the Bowels.

Very fatal, often resulting in death in a few hours.

Symptoms.—At first uneasiness and dulness; fever, and in some cases shivering fits; nose red and mouth hot; breathing and pulse quick; ears and legs cold; and the passing of small quantities of dung at short intervals. The horse will show great pain by kicking at his belly and whisking his tail.

Cause.—A chill when overheated, often from drinking cold water when hot, over-exertion, a too full meal when the animal is tired and worn out.

Prevention.—These inflammatory diseases of the internal organs are very common among draught-horses. There

is no more pernicious habit than that of working horses during hot weather, without allowing them for hours together to have any drinking-water till they get into a probably cold stable, where they are allowed to drink their fill and stand for an hour during the dinner-hour till they are chilled inside and out. It seems extraordinary that so many horses stand this treatment. Allow farm-horses frequent moderate drinks of water while at their work, when that work is heating or the weather hot. The exercise after drinking will prevent any chills, and on their return to the stable they will eat their corn without requiring water to an injurious extent.

Treatment.—Place in a cool stable and clothe warmly; give warm glysters of thin gruel and Epsom salts, ½ lb. Foment the belly with hot water and rub it with embrocation (No 12), and every three hours give in gruel tincture of ginger, 1 oz.; tincture of opium, 1 oz.; chloroform, 4 drs. Rub aud bandage the legs. Give plenty of warm linseed-gruel. If costiveness continue, give with great caution in gruel small doses of aloes, 2 drs. dissolved, and ½ pint linseed-oil, and send for a veterinary surgeon.

Inflammation of Stomach.

A disease of rare occurence.

Symptoms.—Animal shows signs of pain, breathes hard, sweats about the shoulders, thirst, flow of saliva, great prostration, legs and ears become cold, the animal staggers, and soon dies.

Cause.—Foreign body in stomach, or from a vegetable or mineral poison.

Treatment.—Give linseed-oil, 1 pint; tincture of opium, 2 oz., and give after every two hours two eggs beaten up in a pint of linseed-gruel, and add to it an ounce of tincture of nux vomica, and one of tincture of belladonna.

Twist of the Bowels.

A twist in a portion of the bowels, which causes strangulation, mortification, and death.

Symptoms.—Excruciating pain, the animal is up and down, blowing heavy and sweating, nothing seems to give ease, and death comes as a happy release.

Cause.—Mostly rolling when in pain.

Treatment.—Nothing can do any good except opium, which will ease pain until death.

Inflammation of the Bladder.

See Inflammation of the Kidneys for symptoms and treatment, *infra*.

Cause.—Irritant matter in urine, or stone in the bladder.

Inflammation of the Neck of the Bladder.

Symptoms.—Distended bladder and partial to total suppression of urine.

Cause.—Overstraining or cold.

Treatment.—Give purgative (No. 17), and three times daily in gruel a draught containing Fleming's tincture of aconite, 5 drops; tincture of opium, 1½ oz.; bicarbonate of potash, ½ oz. Apply hot fomentations to the loins, and call in a veterinary surgeon, who will, if necessary, draw off the urine with a catheter.

Parturition.

The act on the part of a mare to bring forth her young. The period of pregnancy in the mare is usually eleven months, though it sometimes varies between ten and twelve months. This animal seldom brings forth more than one at a time, nevertheless twins sometimes do occur, but they rarely live long after birth.

Signs of Foaling.—The mare is dull, abdomen sprung, back bent, vulva swollen, and a little mucus discharged. The udder becomes enlarged, wax appears at the ends of teats. As the time draws near the mare becomes restless, paws, keeps on lying down, an anxious expression in the eyes, and frequent passing of dung and urine. The water-bag soon makes its appearance, which ultimately bursts, after which the young foal appears.

Treatment.—The mare should be placed in a nice clean loose-box with plenty of straw, and do not disturb her by keeping open the door and looking in frequently.

Inflammation of the Kidneys.

Symptoms.—Fever and peculiar position, standing with legs wide apart; hot loins, and tenderness in that part; suppressed urine, which is dark in colour

and tinged with blood; straining to avoid urine. Put the hand up the rectum, and the bladder under the rectum will be empty without undue heat. In cases of inflammation of the neck of the bladder, it will feel hard and full. In cases of inflammation of the bladder, it will feel empty, but there will be great heat.

Cause.—Unwholesome food, particularly musty oats, or a violent overstraining or cold.

Treatment.—Remove into a comfortable box, clothe warmly, give plenty of water, feed on linseed and bran mashes, foment the loins with hot water. Apply embrocation (No. 12) to the loins over the kidneys, but leave the turpentine out of the embrocation, and give purgative (No. 17); give also warm glysters of soap-and-water. When the purgative has acted give white hellebore, 5 grs.; tartar emetic, 1 dr., mixed into a ball, three times a-day till cured. If possible, find out and remove the cause of the disease, if it arises from improper food.

Inflammation of the Womb.

An inflammatory disease of the womb shortly after foaling.

Symptoms. — Animal becomes dull and stiff, appetite lost, secretion of milk diminished, breathing hurried; the animal grinds its teeth, suffers from colicky pains, frequently lies down, stamps, kicks its belly, the vulva is swollen and a discharge comes from it, which is at first yellow, but afterwards becomes a chocolate colour.

Cause.—Exposure to cold, retention of the after-birth, and injuries received during foaling.

Treatment. — Put hot cloths across the loins, and give every three hours the following draught in a pint of linseed-gruel: tincture of belladona, 1 oz.; spirits, ether (nitrous), 2 oz.; and soda sulphite, ½ oz.

Inflammation of the Liver.

An uncommon disease.

Symptoms.—Dull pain, but no great uneasiness, yellowness of the mouth and nostrils.

Cause.—Overfeeding and insufficient exercise.

Treatment.—Should the attack be severe, call in a veterinary surgeon. Give for a purgative—sulphate of magnesia, 5 oz.; virgin scammony, 30 grs.; and feed on bran-mashes with a light diet. A useful draught, to be given three times a-day in gruel, is composed of chloride ammonium, 2 drs.; bicarbonate potassium, ½ oz.; Fleming's tincture of aconite, 5 drops; chloroform, ½ oz.

Jaundice or Yellows.

Symptoms.—A yellow tinge in the eyes, skin, and mouth; urine quite yellow; loss of appetite, and constipation.

Cause.—Obstruction of the flow of bile from the liver, disease of the liver or congestion arising from cold or other cause.

Treatment.—Feed on mashes, thin warm gruel, and green food; clothe well if weather is cold; give every morning calomel, ½ dr. If inflammation sets in, give every morning in gruel a draught containing solution acetate ammonium, 4 oz.; Fleming's tincture of aconite, 5 drops; spirit of nitrous ether, 1½ oz. When recovering give tonic (No. 21).

Peritonitis.

Inflammation of the lining membrane of the abdomen.

Symptoms.—Small hard pulse, colicky pains, dulness, constipation, and tenderness on pressure over the abdomen, which feels hard and rounded.

Cause.—It may arise from cold and neglect, but generally from worms or wounds, as after castration.

Treatment.—Hot fomentations persistently applied; give opium or laudanum, with small doses of spirits of ammonia every four or five hours, gruel and linseed-tea to drink, and soft sloppy food.

Poisons.

The only vegetable poison that need be mentioned is yew. The eating of this tree accounts for the death of many horses every year. If the poison is suspected, give at once linseed-oil, 20 oz., and drench with spirits of ammonia, 3 oz.; brandy, 5 oz.; gruel, 1 pint. Repeat dose of oil, if it does not operate in twelve hours.

Lead-poisoning.

A disease due to the introduction of lead into the system.

Symptoms.—The horse has a careworn expression, staring coat, back arched, legs cramped, colicky pains, and flow of saliva from the mouth.

Cause.—Grazing near rifle-butts or lead-smelting works, drinking water impregnated with lead, licking lead paints, and the barbarous practice of giving shot for broken wind.

Treatment.—Give sulphate of magnesia, 8 oz., in a pint of water, with tincture of belladonna, 1 oz.; tincture of capsicum, ½ oz. Afterwards, give every four hours until the animal is purged, sulphate of magnesia, 1 oz., tincture of belladonna, 1 oz., in half a pint of water.

Arsenic-poisoning.

Due to arsenic either given accidentally or intentionally.

Symptoms.—Colic, staggering gait, quick breathing, cold ears, diarrhœa, and death.

Cause.—It is sometimes caused by clever grooms giving it to improve the condition of their horses, or by allowing animals to graze where recently dipped sheep have been lying.

Treatment.—Give every two hours the following in half a pint of water: iron sesquioxide, ½ oz.; brandy, ½ pint.

Navel Rupture.

A round swelling under the belly of young horses.

Symptoms.—A soft swelling in the centre of the abdomen, ranging in size from a fowl's egg to a cocoa-nut.

Cause.—Due to non-closure of the navel.

Treatment.—Trusses, bandages, or plasters frequently fail, and it may have to be operated on by a veterinary surgeon.

Scrotal Rupture.

Descent of the small intestines into the scrotum.

Cause.—By galloping, or a severe strain, but very often there at birth.

Symptoms.—The testicles look large and feel soft.

Treatment.—Castrate by the covered operation (p. 497).

Staling of Blood,

or mixture of blood with the urine.

Cause.—Inflammation of the kidneys.

Treatment.—Feed on green meat and mashes; clothe warmly; give Fleming's tincture of aconite, 8 drops, every night. Purgative (No. 17) should be given, and three times a-day a draught in gruel, composed of extract of ergot, ½ oz.; tannin, ¼ oz.; dilute sulphuric acid, 2 drs. When the appearance of blood in the urine has ceased, give daily Peruvian bark, 1 oz.; sulphate of iron, 1 dr.

Stone in the Bladder (Calculus).

Symptoms.—Irregular voidance of urine, sometimes total suppression, great pain, suddenness of attack, great uneasiness, a sediment from the urine on the floor of the stable, and profuse perspiration during attack.

Cause.—Formation of solids in the bladder, often brought on by weakness or disease of the kidneys.

Treatment.—Give morning and evening, in gruel, a draught containing bicarbonate of potassium, 1 oz.; benzoate ammonium, 1 oz. If the gravel or small stones are not passed, place the case in the hands of a veterinary surgeon, who will treat it for calculus, the removal of which requires an operation, the stone being too large for the horse to pass.

Worms.

Symptoms.—Rough coat and half-starved appearance, at other times an enormous appetite, but no improvement in condition; appearance of a yellow powder about the anus, with irritation and switching of the tail.

Treatment.—When fasting give in gruel draught (No. 11), and repeat in three days.

Protrusion of Anus.

Cause.—A drastic purge, straining during foaling, or in a violent fit of colic.

Treatment,—Wash the anus with equal parts of olive-oil and liquor *opii sedativus*, and gently work it back to its proper place; afterwards depress the tail.

DISEASES AFFECTING THE LIMBS, FEET, AND SKIN.

I.—THE LIMBS.

Broken Knees.

Cause.—A fall. Horses first brought from a stable are liable, from no fault in their build, to stumble and fall through excitement. They are also apt to tread on a rolling stone and fall. A horse that stands over—*i.e.*, whose fore legs are too far under him—and those that shuffle along without lifting their feet, owing to the formation of the shoulder, are very liable to fall forward.

Treatment.—Wash with warm water and remove the dirt. Apply a linseed-meal poultice to allay inflammation; after twelve hours remove the poultice. If a yellow kind of oil exudes from the wound, it shows that the joint has been cut into, and a veterinary surgeon alone can deal with the case, which, to say the least, is a desperate one. If, however, there is no yellow joint-oil to be seen, wash the wound with a weak solution of carbolic acid, or boric acid, 1 part; water, 30 parts; adjust the injured pieces of skin, apply a piece of carbolised tow, bandage with carbolised gauze, and so dress twice a-day. Keep animal on the pillar reins until the knees are healed. If inflammation runs high, give every four hours in gruel a draught containing salicylate sodium, 3 drs. Purgative (No. 19) may be useful if the health of the horse is affected.

Capped Hocks,

or a swelling on the point of the hock, which does not often cause lameness, but is shown by the swelling and tenderness on the point of the hock.

Cause.—Often caused by striking a closing door or gate.

Treatment.—Foment with hot water and bathe with cooling lotion (No. 7); give complete rest till cured. Apply blister (No. 4) if the swelling has a tendency to harden. If this swelling is neglected it may prove incurable.

Capped Elbow.

A hard swelling at the elbow, varying in size.

Symptoms.—Rarely lameness; the swelling is hard, and about the size of a large hen's egg.

Cause.—It is caused by the heel of the shoe in lying, which either irritates or squeezes the skin at the elbow, and sets up inflammation.

Treatment.—If observed when only commencing, treat as for capped hock; but if left until it gets confirmed and callous, even blisters and setons are of little use. Then it may have to be cut out, but save the skin; place in the wound a piece of tow saturated with chromic acid, 1 part to 20 parts of water, sew the wound up, pull the tow out next day, dress again with the lotion, and continue dressing until healed.

Curb.

A swelling below the hock, seen plainly when the horse is viewed sideways.

Cause.—A sprain of the ligament under the hock.

Treatment.—Foment with hot water and apply cooling lotion (No. 7). If the swelling does not go down, apply blister (No. 4), and give complete rest. Curby hocks are natural to some horses, but once the horse reaches maturity they seldom give trouble.

Cutting.

The name given when a horse strikes the inside of the fetlock with the shoe of the other foot. Horses with feet turned in or out, especially the latter, are most liable to this defect. It is often brought on by fatigue or by working a young horse too soon.

Treatment.—Let the shoe fit the hoof of the cutting foot, which should be rasped on the inside to reduce it. Foment the swelling caused by the bruises, and apply lotion (No. 7). See remarks on "Speedy Cut" (p. 463).

Enlargement of the Hock.

Arising from inflammation.

Cause.—A sprain or a blow, such as a kick by another horse: it produces great lameness.

Treatment.—Foment with hot water, apply lotion (No. 7), and give perfect rest. Purgative (No. 19) will help to relieve the inflammation, or a draught

in gruel, containing salicylate sodium, 3 drs., every four hours.

If any enlargement remains when the inflammation is reduced, apply blister (No. 4). The object in view must be to prevent a permanent enlargement of the hock.

Fractures

are divided into simple, compound, and compound comminuted fractures.

A simple fracture is when the bone is broken into two pieces, compound when broken and associated with a wound, and a compound comminuted when broken into several pieces and associated with a wound.

In the horse simple fractures are the only ones worth trying to treat. In the case of the other two kinds, the sooner the animal is destroyed the better.

Before trying to set a fractured limb, it is wise to consider whether the animal is worth it, and if placed in slings will he be quiet. Having decided to set the limb, place the animal in slings; take some gutta-percha, place it in hot water, and mould it to the limb, or use some sheet-tin, and after moulding it to the part, cover with some flannel to prevent its cutting at edges. Take the splints thus made, place them on the part to be set, and pack where they do not exactly fit with tow; then take a nice long bandage, wind it tightly around, and do not touch it for a couple of months.

If the animal is a restless one, it will be only wasting time to try and set the limb. It is a false but popular idea that horses' bones will not unite; nothing will unite quicker, if the animal will only nurse its limb.

Grease.

A disease of the skin of the heel, generally of the hind feet.

Symptoms.—Inflammation, with pain and lameness at first; discharge of matter; at first limpid, soon gets thick, fœtid, and irritating; swelling; often going on to ulceration and the formation of fungus-like growths called "grapes."

Cause.—Too little exercise and too much corn; bad or innutritious food; too much coarse boiled food; washing with cold water without afterwards drying the legs, and chills caused by work in wet, muddy ground, after keeping in too warm a stable.

Prevention.—The legs of horses subject to this disease should not be washed unless they are afterwards dried. Let the mud dry on the legs, and then brush it off; it is more than probable if you do this, you will have no more trouble, provided other conditions are favourable.

Treatment. — Wash the heel with warm soap-and-water, or if very bad, poultice at first with boiled turnips and bran, sprinkling the sores all over with soot before applying the poultice, and rub in ointment composed of oleate of zinc, 1 part, and vaseline, 2 parts; or lard, 1 oz., sugar of lead, 1 dr.; or wash with lotion containing chromic acid, 1 part, water, 8 parts. If the case proves obdurate, use ointment containing white precipitate of mercury, 1 dr.; liquor *carbonis detergens*, 1 dr.; vaseline, 1 oz. Give a mild alterative, Barbadoes aloes, 4 drs.; Castile soap, 1 dr.; oil of caraways, 10 drops, or condition powders (No. 6). Sulphate of soda, 4 oz., in the food every night may prove a useful aperient. Iodide of arsenic, 4 grs.; liquorice-powder, 2 drs.; gentian, 3 drs., made into a ball with treacle and linseed-meal, is a very good thing for this disease, and a ball should be given every night.

Grogginess, see *Navicular Disease* (p. 467).

Open Joints.

The following joints are sometimes opened: hock, stifle, knee, and fetlock joint.

Symptoms. — Great pain and lameness; a small wound is seen, and from it flows a yellowish fluid the consistency of glycerine.

Cause. — Kick from another horse, accidents of various kinds, and by a groom pricking the horse with his fork when bedding the animal up.

Treatment is unsatisfactory. Give a dose of physic; place a cold-water bandage around the joint for twenty-four hours; afterwards call in a veterinary surgeon.

Knee-Tied.

A natural defect, for which there is no cure. It is a want of depth under the knee, owing to the hinder knee-bone not being large enough.

Mallenders and Sallenders.

Dry scurfy humours, which, when affecting the front of the hock, are called *Sallenders*, and when under the back of the knee *Mallenders*.

Cause.—Neglect in the stable.

Treatment.—Rest, and apply ointment containing tar, 1 oz.; sugar of lead, ½ oz.; lard, 4 oz.; and give draught morning and evening containing bicarbonate potassium, 6 drs.; spirit nitrous ether, 1 oz.; tincture gentian, 1 oz.; water, 8 oz. Feed on green food and improve stable management. If the above treatment is not successful, apply blister (No. 4), mixed with three times its weight of lard.

Tumours.

There are two kinds, internal and external. The former are usually situated in the brain, womb, abdomen, and liver, and nothing within the power of man can do any good. The external tumours are the ones we are often asked to cure, and they usually appear on the shoulders, neck, under the tail, and at the end of the cord after castration.

Treatment.—There are various ways of removing them, and the best is by the knife. If the tumour is narrow at its base, an easy and safe way to remove it is by winding a piece of green silk around its base, and allowing it to drop off. In cutting large tumours out, veterinary surgeons sometimes come in contact with large arteries, and these must be caught up and tied. When a tumour appears after castration, use the hot iron and clams to remove it.

Rheumatism.

Change of temperature and cold often produce stiffness of the joints, varying in intensity.

Treatment.—Keep the animal warm, and rub the part affected with liniment of belladonna, and morning and evening give in ½ pint of water iodide of potassium, 1 dr. It might be necessary in extreme cases to apply blister (No. 1).

Rupture of the Suspensory Ligament.

Lameness from this cause is generally incurable. The suspensory ligament sustains the foot, and the rupture of it allows the fetlock to drop down almost to the ground. If the horse cannot bend his foot, it is not the suspensory ligament that is ruptured.

Cause.—Over-exertion or strain.

Treatment.—Perfect rest, and put on a high-heeled shoe. Bandage the legs,[1] foment, and apply lotion (No. 7); if this does not reduce the swelling, apply blister (No. 4) and give a mild purgative (No. 19).

In most cases the lameness will be permanent.

Hip Knocked Down.

Symptoms.—At first great swelling, the animal goes lame, but when the swelling is reduced the hip that is knocked down looks less than the other when looking at it from behind.

Cause.—Through falling, in knocking against a wall, in passing through a doorway.

Treatment.—Little can be done except placing the animal in slings, and bathing the part with hot water; if an abscess forms, the piece of bone that is knocked off must be cut down upon and removed.

Spavin.

There are two kinds:—

1. *Bone-Spavin.*

Symptoms.—Bony enlargement on the inside of the hock-joint towards its lower aspect, producing lameness when first formed, till the parts accommodate themselves to the enlargement. Afterwards, the lameness may be apparent only when the horse is first taken out of the stable, unless it interferes with the movement of the joint, when a small spavin may permanently lame a horse.

Cause.—Hereditary, local injury, sprains of the ligaments and concussion,

[1] The frequent bandaging of the legs is apt to produce an unsightly curliness of the hair. The application of alum, 1 oz.; salt, 2 oz.; in 1 quart of water, will do much to remedy it.

overwork when young, peculiar formation, improper shoeing.

Treatment.—Perfect rest and repeated application of blister (No. 4). Should blistering not remove the lameness, firing may have to be resorted to. I have found ossoline effect a cure when other remedies fail. Spavins always constitute unsoundness.

2. *Bog-Spavin.*

Symptoms. — A tumour, resembling a wind-gall on the hock, formed on the inside of the front of the hock. The swelling is due to distension of the bursa of the hock with joint-oil, and is usually permanent, but does not much interfere with slow work.

Cause. — Sprain and over-exertion. Hereditary conformation.

Treatment.—If it is not considered advisable to keep the horse for slow work without treating the spavin, which, in my opinion, is the wisest course to pursue, apply blister (No. 3) and allow perfect rest, in the hope of effecting a cure, but it is not likely to be permanent.

Speedy Cut.

Horses are apt to strike the inside of the fore leg at the lower part of the knee with the other foot when trotting fast, or lifting their feet high. Horses liable to this are dangerous to ride or drive, the force of the blow being sufficient in some cases to bring them down. Great pain and inflammation and swelling result from the blow.

Prevention.—Cut the hoof away on the inside, and put on a shoe of equal thickness at toe and heel, having only one nail on the inside, and not projecting beyond the part of the hoof which has been rasped. Keep a speedy cutting boot on the injured leg to protect it.

Treatment. — Foment the bruise, apply lotion (No. 7), and allow complete rest till cured. If the bruises have a tendency to harden, apply blister (No. 4).

Wounds.

Wounds are divided into abrasions, incised, punctured, contused, and lacerated wounds.

An Abrasion.

Caused by falls, kicks, barb-wire, and short nails, &c.

Symptoms.—The skin is torn, but the wound is not of any depth.

Treatment.—Wash well with warm water, dress with tincture of myrrh, and dust fuller's earth over it.

Incised Wounds.

Caused by a knife, scythe, or any such sharp instrument.

Symptoms.—The wound usually is deep, and the edges cleanly cut.

Treatment. — Having thoroughly cleansed the wound, sew it up with carbolised gut, and dress with *liq. carbo detergens*, 1 oz. to 30 oz. of water.

Punctured Wounds.

Caused by long nails, horns of cattle, forks, parts of agricultural implements, and broken shafts.

Symptoms.—A wound of some depth, and though it may not be large to look at, it is the most fatal of all wounds.

Treatment.—If it is bleeding freely, plug it up for some hours with carbolised tow; after the tow is removed, inject into the wound, by the aid of a wound-syringe, the following lotion: glycerine, 3 oz.; carbolic acid, 1 oz.; water, 30 oz.; and keep in the wound a piece of tow soaked in the lotion, until it heals. Remember, wounds of this kind must heal from the bottom.

Contused Wounds.

Caused by a severe blow, fall, or kick.

Symptoms.—This is more of a bruise than a wound.

Treatment.—Bathe for two hours twice a-day, and afterwards dress it with lotion (No. 7).

Lacerated Wounds.

Caused by a bite from a dog or horse, by being entangled in a fence and struggling, and in coming against the latch of a door in passing through it.

Symptoms.—A wound usually of some size with its edges ragged.

Treatment.—Cleanse the wound well with hot water, sew up any part you think necessary, and dress with *liq. carbo detergens*, 1 part; water, 30 parts.

Splint.

Symptoms.—A bony enlargement on the inside of the fore leg below the knee.

It often produces lameness until fully grown, when the lameness disappears, unless the splint interferes with a tendon or joint. Splints are not thought much of unless near a tendon or joint.

Cause.—Young horses are very subject to splints: they arise from injuries to and a sudden weight thrown upon the bones of the legs, and usually found on the inside of the canon-bones of the fore legs.

Treatment.—Blister (No. 4) applied once or twice will generally effect a cure. As a horse gets older splints will generally disappear.

Sprain of the Back Sinews.

Symptoms.—Great pain, thickening and inflammation in the leg above the fetlock, preventing the horse bringing his foot flat to the ground. The leg will appear to be round instead of flat.

Cause.—Inflammation of the sheath which encloses the back tendons, the result of hard work or excessive strain.

Treatment.—Perfect rest; foment with hot water and then poultice with linseed-meal and bathe with lotion (No. 7); keep the bowels open with purgative (No. 19). When the heat subsides, and the horse can put his foot flat to the ground, bandage the leg with bandages steeped in vinegar. Should the inflammation continue, apply embrocation (No. 12), or blister (No. 3), and give two or three months' complete rest.

Sprain of the Coffin-joint.

Symptoms.—Sudden lameness, and heat and tenderness round the coronet.

Treatment.—This kind of sprain should be treated at once, before the inflammation spreads. Apply blister (No. 3), and give occasionally purgative (No. 19). Bandage the leg and give perfect rest.

Sore Shins.

Common in young horses that have not done much work.

Symptoms.—Lameness; if both legs are affected, the animal rests first on one then on the other leg, and the legs have a doughy feel.

Cause.—By a young horse galloping before the bones are properly developed.

Treatment.—Put cold-water bandages on for a few days, and then blister with (No. 1).

Sprain of the Fetlock.

Symptoms.—Lameness, attended with heat and tenderness of the fetlock, is probably a sprain of the fetlock.

Treatment.—Apply repeatedly blister (No. 3) till the heat subsides, then bandage lightly to strengthen the fetlock; give perfect rest.

Sprain of the Round Bone or Hip.

Symptoms.—A sprain of the rounded bone of the thigh, by which the horse loses all power of moving that quarter, and drags his leg, resting it on the toe alone.

Cause.—Sudden strain, slip, or fall.

Treatment.—Foment and apply immediately blister (No. 3), and call in a veterinary surgeon.

Sprain of the Shoulder.

Symptoms.—Great pain, especially when going down-hill, and a dragging of the foot forward on the toe. If the foot is drawn forward, the horse shows pain. No outward swelling or heat.

Cause.—Accident from slipping or going over rough ground. Young horses are very liable to this.

Treatment.—Perfect rest; apply hot fomentations to the shoulder and bathe with lotion (No. 7), and, if necessary, blister (No. 3); keep down inflammation by giving purgative (No. 19). A long rest, combined with this treatment, will generally effect a cure.

Shoulder-Slip.

A peculiar outward movement of the shoulder when the animal walks, sometimes, but not always, accompanied by lameness.

Symptoms.—The shoulder-joint looks enlarged, but the muscles of the shoulder are wasted.

Cause.—By horse being put to plough too young; by the one foot being in the furrow and the other out, and by pulling awkwardly and using the shoulders unequally before getting accustomed to the draught.

Treatment.—Blister the shoulder with (No. 1), and turn the animal out for three months.

Sprain of the Stifle-joint.

Symptoms.—Dropping of the hind quarters and dragging of the leg; great heat and swelling, and tenderness of the stifle.

Cause.—A blow, sprain, or overwork.

Treatment.—If the stifle has been dislocated from a kick or blow, send for a veterinary surgeon, who alone can judge as to the treatment. In case of sprain, apply warm fomentations and lotion (No. 7) till the inflammation is somewhat reduced, and then apply blister (No. 3); give perfect rest and purgative (No. 19).

Dislocation of the Stifle-joint.

This disease is usually seen in young horses, and is due to the slipping outwards of the patella or bone which corresponds to the lid of the human knee.

Symptoms.—One or both stifles may be wrong, the joint looks swollen, and when the animal moves it slips out and in with a peculiar noise.

Cause.—Hard galloping, feeding on hilly pasture, and often a disease of the joints occurring in foals.

Treatment.—In young horses, seems to be of little use; but blisters may be tried. If the swelling is accompanied by heat and pain, apply hot fomentations and cooling lotion first. In older horses it can be reduced by flexing (working backwards and forwards) the leg; push it back into its proper place, and apply a blister.

String-halt.

Symptoms.—A sudden snatching up of the hind leg or legs, but usually only one leg, which makes the horse's action peculiar. Probably a nervous disease, and practically incurable. It produces no lameness, but is liable to get worse, and is always considered unsoundness.

Cause.—Often produced by rheumatism or by leaving a horse standing in a stable without sufficient exercise, and is hereditary.

Treatment.—Doses containing citrate iron, 2 drs.; and ammonium, 2 drs.; tincture nux vomica, 2 drs.; tincture capsicum, 2 drs.; carbonate of ammonium, 2 drs., given in water night and morning, may relieve and strengthen the system with satisfactory results.

Mud-fever.

Symptoms.—Heat and swelling of the legs, and the animal goes stiff; there is a certain amount of fever, hence the name.

Cause.—The chilling and caustic action of mud, which in cold weather produces inflammation in the legs of horses, especially when the legs are rendered tender by clipping, repeated washing, and imperfect drying.

Prevention.—Do not clip the horse's legs; let the mud dry, and then brush it off; never wash them.

Treatment.—Dress the legs with a mixture of glycerine, 8 oz.; carbolic acid, 1 dr.; and *liq. plumbi acet.*, 1 oz.

Swelled Legs.

Horses of a coarse nature are very subject to swollen legs, especially the hind ones.

Symptoms.—With or without great heat; lameness accompanied by quick pulse and fever.

Cause.—Overfeeding, too little exercise, and change of food.

Treatment.—If there is much fever, foment the legs, bathe with lotion (No. 7), and give a ball containing turpentine, 1 oz.; ginger, ½ dr.; linseed-meal, ½ oz.; and two hours after give purgative (No. 19). If there is not much fever but swelling, stiffness, and pain in the legs, foment them and rub lightly with embrocation (No. 12). Give gentle exercise and purgative (No. 19).

Thoroughpin.

Symptoms.—Very similar to wind-gall (see below). An enlargement at the upper and back part of the hock between the tendon and the bone. It usually projects on both sides of the hock, but rarely causes lameness, if taken in time before the swelling becomes callous.

Cause.—Overwork or strain.

Treatment.—Rest, and apply blister (No. 3 or 4) till the swelling is reduced.

Wind-galls.

Symptoms.—Puffy elastic swellings situated just above the fetlock, which

become large and hard, causing lameness.

Cause. — Strain of the tendons, and overwork in young horses.

Treatment. — Bandage with flannel steeped in vinegar till the swelling subsides. If this does not effect a cure, blister (No. 3) should be applied. Windgalls do not, as a rule, cause unsoundness.

II.—THE FOOT.

Canker.

A disease of the frog, often extending to the sole.

Symptoms. — This disease is sometimes the result of neglected thrush, and differs from it in its tendency to spread, and in the swelling or enlargement of the affected parts. The diseased frog assumes a soft, fungatory appearance; is liable to bleed on being touched; emits a very fœtid, offensive, although nearly colourless discharge; and unless energetically treated the disease is apt to spread over the whole sole.

Cause.—Hereditary; but often neglect and want of cleanliness.

Treatment.—Cut away the sole where the canker is situated, removing all fungus, and apply acid solution of nitrate of mercury and bandage up the foot, or dust on iodoform night and morning; morning and night bathe with lotion—carbolic acid, 1 part; glycerine, 1 part; and in four days repeat the application of acid solution. If the fungus still grows, call in the aid of a veterinary surgeon.

Contraction of the Foot.

Symptoms.—A natural hoof is nearly circular, but sometimes through neglect or bad shoeing the hoof is made concave, and the heel contracts, producing permanent lameness if not attended to.

Cause. — Neglect in stable management or shoeing. Extreme dryness, or allowing the shoes to remain on too long, will cause the hoof to shrink.

Prevention.—Stopping the feet with cow-dung or moist clay, and removing the shoes.

Treatment.—A contracted foot can hardly ever be cured, but if it is decided to attempt a cure, a veterinary surgeon should be called in.

Corns.

Symptoms.—The horn of the sole becomes reddish, soft, and tender. The horse will flinch when this part is pressed, and occasional or permanent lameness results.

Cause. — Careless shoeing or tight shoes, producing undue pressure at a particular point.

Treatment.—Old corns are difficult to cure; fresh ones may be prevented increasing by proper shoeing, and by paring the corn as far as possible without wounding the sole. A bar-shoe may be put on in serious cases with advantage, and the horse shod with leather.

False Quarter.

Symptoms.—It is due to a division of or a want of secretion by part of the coronary band, which extends as the horn grows downwards, making a fissure or wide groove in the hoof. It is a serious defect, often resulting in inflammation and lameness, and from the thinness of the horn it is very liable to injury during work.

Cause.—Injury to the coronary ligament, and sometimes the consequence of neglected sand-crack.

Treatment.—Apply blister (No. 5) to the coronet, and treat the fissure as for Sand-crack (see p. 468). Should the secreting coronary band be permanently injured, no remedy will cure the disease.

Founder (acute),

or inflammation of the feet.

Symptoms. — Great restlessness and continual shifting of the animal's weight from one foot to the other; pain, fever, heaving flanks, hot feet. After a time the horse will lie down and will then rest quietly.

Cause. — Violent exertion on hard roads, or cold causing inflammation; feeding on wheat; unusual or inordinate feeding of any kind; from inflammation of the lungs, or bowels; or from drinking largely of cold water when overheated.

Treatment. — Remove the shoes, foment the feet, and poultice with linseed-meal or bran. Give a draught in gruel every six hours, containing bicarbonate of potassium, 1 oz.; Flem-

ing's tincture of aconite, 5 drops; nitrous ether, 1 oz. Feed on mashes and green food, and keep the poultices on for three days. Bathe the foot with lotion containing ammonium chloride, 2 oz.; potassium nitrate, 2 oz., in 16 oz. water. If the inflammation continues after three days of such treatment, apply blister (No. 2) to the pastern. In extreme cases the aid of a veterinary surgeon is necessary.

Founder (chronic).

The result of acute founder or inflammation of the foot, and nothing can cure it; shoeing may do good.

Navicular Joint Disease.

Symptoms.—A sprain of the joint made by the shuttle-bone at the back of the coffin-joint in the foot of the horse will, if the cartilage of the bone is inflamed, produce lameness. When first brought out of the stable, the horse will tread on his toes and avoid bringing his heel to the ground; consequently he will go lame down-hill; when resting he will point his feet. This lameness is very deceptive, and has often been judged to be in the shoulder.

Cause. — Hereditary; over-exercise after undue rest.

Treatment.—Foment and apply hot linseed-meal or bran poultices; and give purgative (No. 19). The early advice of a veterinary surgeon should be obtained, and he will best determine how ulceration and ossification of the cartilage can be prevented.

Over-reaching,

or wounding of the coronet with the other foot.

Symptoms.—Often inflammation and pain; and the wound, however slight apparently, should not be neglected.

Treatment.—Wash all dirt from the wound, apply a piece of tow dipped in friars' balsam, and tie it up. In severe cases poultice with linseed-meal or bran. If the wound does not heal, call in a veterinary surgeon.

Pricks or Wounds in the Sole.

Symptoms. — Lameness, which can probably be located by pressing all round the sole with a pair of pincers, the tender part being of course shown by the horse flinching.

Cause.—Commonly a fault in shoeing, or a wound caused by a stone, flint, piece of glass, or nail on the road.

Treatment.—Having found the tender place, pare that part of the sole down to the quick, and fill up the wound with a little tow dipped in friars' balsam. If the horse is very lame, or if the wound is festering, apply a poultice of linseed-meal or bran. If it does not heal, touch the place with chloride of antimony, which should induce the crust to form.

Pumiced Feet.

A result of inflammation of the feet. The exudate thrown out between the wall of the hoof and the coffin-bone during inflammation of the feet forces the latter to press on the sole of the foot, flattening it and causing what is called a "pumiced" foot.

Symptoms. — Hollowness of the middle of the front part of the foot. Fulness or convexity of the sole.

Cause.—Inflammation of the foot, or very hard work, especially on hard roads or streets.

Treatment.—No cure. Blisters or stimulating dressings to the coronets may be tried, to increase the growth of healthy horn. Care—in shoeing—that nothing presses on the pumiced part of the foot, or a bar-shoe, is the only thing that can be done.

Quittor.

A suppurating wound of the coronet, often arising from a neglected prick. Wounds of this nature are very serious, and should be left to the veterinary surgeon.

Ringbone.

A most prevalent disease situated in the pastern. In the hind feet, unless the disease is found at the front of the foot, the horse will walk on his toes; in the fore feet, owing to the greater concussion, it is generally at the front and sides, and the animal will walk on his heel.

Symptoms.—Pain and inflammation, with enlargement of the bone above the coronet, generally on both sides of the

pastern-joint, which, if not checked, will spread rapidly.

Cause.—Horses having straight pasterns are very liable to this disease, owing to their peculiar formation. It may also be hereditary.

Treatment.—Apply hot poultices to the leg and give purgative (No. 19), repeating the dose if necessary. If there is no improvement, blister once or twice with No. 4. Firing is often resorted to with success. Complete rest for some months will be necessary.

Sand-crack.

Symptoms.—Cracks in the fore feet will generally be found on the inner side, and in the hind feet in the front of the hoof.

Cause.—Brittle nature of the hoof, previous disease, heavy work or neglect.

Treatment.—Wash the crack to clean it from gravel and dirt. If the pain and lameness are severe, it may have to be poulticed. Pare and rasp it, and apply ointment composed of oil of tar, 2 oz.; fish-oil, 4 oz.; and stop the foot with cow-dung and moist clay. By passing a red-hot iron above and below the crack, healthy sound horn may be got to grow from the top. If any growth of proud flesh appears in the crack, apply nitric acid, and blister the coronet with No. 2. Give rest and cover the crack with a plaster made of pitch, and bind the whole up firmly for five days. If the coronet has been divided, the aid of a veterinary surgeon had better be obtained.

Seedy Toe.

A disease of the foot in which an unhealthy horn is secreted that fails to maintain the connection between the horny laminæ and the wall of the hoof.

Symptoms.—There may or may not be a swelling of the wall of the foot, generally situated at the toe; sometimes attended with lameness. If the part affected is rapped with a hammer it will sound hollow, and by paring, the crack or hollow inside the wall-part of the foot can be found.

Cause.—Previous disease or injury, naturally weak feet, pressure of a part of the shoe, generally the clip.

Treatment.—Remove the cause, if practicable; pare away the diseased portion of the hoof, and apply blister (No. 2) to the coronet. Rest till cured. Afterwards shoe with side-clips.

Side-bones.

Symptoms. — Somewhat similar to Ringbone (p. 467), except that the disease is located above the heel; it is an ossification of the cartilages of the foot. Usually found in heavy draught-horses, and in the fore feet rather than in the hind feet. If the horse has good, well-developed feet, they do not generally cause lameness.

Cause. — Concussion and hereditary predisposition; bad shoeing.

Treatment.—Apply blister (No. 5); if this does not cure the lameness, have Professor Smith's operation performed on the foot by a veterinary surgeon; some of the well-known patent specifics may be tried with a chance of success.

Thrush.

A disease of the frog, which secretes a fœtid matter instead of horn.

Symptoms. — A discharge of matter from the cleft of the frog. There is not often lameness, and the disease can be detected only by the matter exuding from the frog. If thrush is neglected, it will increase, the frog will become soft and split up, the horn will disappear, and canker of the sole may supervene.

Cause.—Generally excessive moisture in the bedding, bad stable management, and constitutional predisposition.

Treatment.—Give purgative (No. 19), clean the frog thoroughly, and pare away all loose horn, apply a lotion to the frog, composed of carbolic acid, 1 part; glycerine, 6 parts, and place tow moistened with this lotion in the cleft of the frog every night. If possible, remove the cause of the disease. It is not necessary or expedient to turn the horse out to grass.

Weakness of the Foot.

Generally a fault in the make of the horse. Sometimes the result of disease. A well-formed foot should be at an angle of 45° from the coronet to the toe; a weak foot will be perhaps 36° to 40°, which is not sufficient to bear the pressure required. No cure for this defect.

Rasping the wall of the hoof is often the cause of this complaint.

Firing

is a painful operation often unnecessarily performed, for more than 50 per cent of the horses that are fired are as lame after the operation as they were before. Firing was at one time greatly in vogue, but, like bleeding, it is getting out of fashion, and by-and-by horses with fired legs will be as rare as those with cut ears. It is thought by some that the lines in firing act as a permanent bandage to the weakened part: such is not the case, but firing does act as a counter-irritant of a severe kind.

Before you resort to firing, blister your horse once or twice, and give it a three months' run at grass; then if it comes up lame, think about firing; but remember there are some cases of lameness that nothing will ever cure.

There are two kinds of firing—lines and dots: line firing is the best for curbs, ringbones, and the back tendons; the dots are preferable for splints and spavins.

Having clipped the hair off the part to be fired, secure your animal, take the iron and make the lines at first superficial, then with a fresh iron deepen them, but never go through the skin in line firing; afterwards rub blister in, and tie the animal's head up for forty-eight hours.

Blistering.

Clip the hair off the chosen part, and rub the blister in for at least ten minutes, then tie the animal up for twenty-four hours. After a few days a second or third application may be necessary.

III.—THE SKIN AND ITS DISEASES.

Hide-bound.

A want of oily matter, which produces hardness of the skin, giving the coat a rough look. It shows that the digestive organs are out of order, and is not so much a disease of the skin itself.

Treatment.—Give purgative (No. 19), and afterwards daily in the food condition powder (No. 6). Powerful tonics should be avoided.

Lice

may be destroyed by applying a lotion composed of tobacco, 4 drs., in a pint of hot water, or by using an ointment composed of white precipitate of mercury, 1 part, lard, 12 parts, well rubbed in. It is best to clip the horse before applying these dressings. Cleanliness and nourishing food will prevent their reappearance.

Mange or Itch.

Symptoms.—Loss of hair, itching, tenderness, and scurfy eruption, from which matter issues. When the scab falls off, a larger blotch will appear. It generally begins at the root of the mane or on the neck.

Cause.—Stable neglect, dirt, and contagion, it being due to the presence of animal parasites — small insects called *Acari.*

Treatment.—Give purgative (No. 20), and rub the places with ointment composed of sulphur, 1 oz.; lard, 1 oz. If this does not effect a cure, add to the ointment 30 grs. of white precipitate of mercury. This disease is often very obstinate, and patience must be exercised. A little salt should be given with nourishing food, and the skin kept clean, using warm soap-and-water for the purpose. Complete isolation is necessary. Wash the stable, harness, brushes, &c., with solution of chloride of lime, 1 pint in 3 gallons of water, before they are used again.

Ringworm.

Symptoms.—A parasitic fungus, which affects the skin in circular patches; the hair comes off, leaving a dry and scaly eruption.

Cause.—Contagion, neglect, or dirt.

Treatment.—If the animal is in high condition, or in a disordered state, give purgative (No. 20), but if not, give nourishing food, and keep him clean and isolated from other animals. Rub the fungus with ointment composed of oleate of mercury, 1 part; lard, 2 parts, till cured. Clean the stable, harness, brushes, &c., with water containing 1 pint of chloride of lime to 3 gallons of water before they are used again.

Nettle-rash or Surfeit.

Symptoms. — Large pimples, disappearing as quickly as they come, which spread from the neck to different parts of the body.

Cause.—Exposure to chills, or drinking cold water when hot.

Treatment.—Give in a pint of water 2 oz. of spirits of ether and 1 oz. of tincture of ginger, and then treat the same as for Hide-bound (p. 469).

CATTLE.

DISEASES AFFECTING THE HEAD, EYES, MOUTH, AND NERVOUS SYSTEM.

Inflammation of the Brain.

May arise from violence, disease, or as an effect of poisons.

Symptoms.—Great pain and moaning, slow respiration, eyes red, loss of consciousness. Attacks of delirium, and the beast becomes ungovernable till stupefaction returns, accompanied by extreme weakness; at length death ensues.

Cause.—Exposure to great heat, want of water, overdriving; sudden change into a rich pasture.

Treatment.—If the beast is in fair condition you should slaughter it at once. If not, give linseed-oil, 2 pints; croton-oil, ½ dr., and three times a-day, in gruel, hydrate of chloral, 1 oz.; bromide of potassium, 1 oz.; and apply ice or cold water to the head. If the animal survives the first stage, blister the crown of the head and sides of the neck with No. 22. Most probably the animal will never recover.

Paralysis.

There may be palsy of the half, or any part, or of the whole of the body.

Symptoms.—The animal lies, eats, and chews its cud as if nothing were wrong; but when you try to rouse it you will see it makes several attempts to get on its legs but fails. When parturient paralysis appears before calving, it is not so serious as the form of paralysis that comes after calving or an attack of milk-fever.

Cause.—By derangement of the stomach, and is called reflex paralysis; by injury to spine, and before or after calving, and is called parturient paralysis.

Treatment. — Give purge (No. 27), and apply liniment (No. 26) to the whole length of the spine, and every night and morning give in a pint of ale the following drench: tincture of nux vomica, 2 oz.; iodide of potassium, 2 drs.; sulphate of iron, 1 dr.; turn the animal once a-day. When paralysis appears before calving, the cow usually calves before she rises; but if it appears after calving, treatment often does little good, and if fat it may be best to kill the animal. But if a cure is to be tried, pursue the same line of treatment as before calving, and try galvanism.

Thrush in the Mouth.

This usually appears as an epidemic amongst cattle in cold and wet weather.

Symptoms.—Small pimples and vesicles appear on the tongue, lips, and about the mouth; they break and form ulcers, but these ulcers soon heal. There is not much danger in this disease, though a little fever often exists.

Treatment.—Give purge (No. 28); wash the mouth out with alum-water, 1 part of alum to 30 of water, and give night and morning, in a pint of water, 1 oz. of salicylate of soda.

Lockjaw or Tetanus.

A disease of the nerves, producing contraction or spasm of the muscles.

Symptoms. — Sluggishness, and for some days increasing difficulty in mastication and swallowing, till the jaw suddenly becomes rigid. The contraction of the muscles will then extend to the head, neck, and shoulders, and appear to cramp the whole body. Constipation. Recovery is very doubtful.

Cause. — Generally some wound or blow affecting a muscle, or exposure to cold.

Prevention.—If this disease is suspected, give in gruel Epsom salts, 1 lb., and Fleming's tincture of aconite, 10 drops.

Treatment.—Any treatment must be prompt to be efficacious. Give if possible at once, linseed-oil, 2 pints; croton-oil, ½ dr. Inject every three hours glyster of warm gruel, with ½ lb. Epsom salts in it. If constipation continues, re-

peat the dose of croton-oil in warm water. Should the attack result from a wound, poultice it; and treat as directed for the same disease in the horse. Try to induce the animal to drink strong gruel to support the system, and keep the bowels open by the addition of Epsom salts, ½ lb., or common salt, ½ lb. As in the case of the horse, tetanus does not affect the internal organs; the beast will often suffer intense hunger if it cannot get gruel.

Cancer of the Tongue.

This disease, though not often suspected, frequently exists, and the teeth are usually blamed for it; but the disease now known as actino-nycosis is often mistaken for cancer.

Symptoms.—The animal is unthrifty, off its food, frothy saliva flows from the mouth, and it quids its food. On examining the mouth you find the tongue hard in places, and slightly swollen.

Treatment.—As soon as it is detected, kill the animal, or else it will gradually starve to death. The enlargements on the tongue, caused by the presence amongst the tissues of the parasitic fungus known as the actino-nyces, are sometimes successfully treated, if not too far advanced, but they should be left to the veterinary surgeon.

Dishorning and Broken Horns.

In saying a few words about dishorning, we cannot do better than quote a paragraph from the *Veterinary Journal* of November 1888.

"*Dishorning of Stock.*—The Tennessee Agricultural Experimental Station has issued a report on the subject of dishorning cattle. The conclusions to which the experimentalists have come are: that (1) For removing the horns, an ordinary meat-saw is perfectly satisfactory. (2) The horns should be removed as close to the head as possible, without cutting the skull proper. The sawing should be done rapidly, and with long sweeps of the arm if possible. (3) Animals one and two years of age appear to suffer considerably in dishorning. The painful effects decrease with increase of age, so that an animal of ten years old may suffer but very little. This is owing to the layer of flesh surrounding the base of the horn, which is much thicker in young than in old animals. Dishorning causes an abnormal increase of pulsation and temperature, which extends over several days. The appetite is also affected during the twenty-four hours succeeding the operation. (4) Dishorning is more especially to be recommended for those animals that are of vicious temperament, that are what are termed 'masters'; to be applied to bulls and to beef animals that are kept quiet and closely stabled or shipped. (5) From evidence quoted from other sources, it appears that dishorning is not necessarily a cruel practice, but may be conducted to promote ends that are both humane and desirable in live-stock breeding. Mr Sadler, British Consul at Chicago, reports that in his very extensive district the system of dishorning or dehorning cattle is rapidly increasing. Some farmers have dehorned their whole herd. It has been calculated that 200,000 cattle and horses die each year in the United States from horn-thrusts. The advocates of the system of dehorning claim that, besides lessening this loss and that of human life, much shed-room is saved, less hay is consumed, there is less turmoil from restive animals, and that cows, being more quiet and docile, give more milk.

"In the case of calves, the horn is extracted by a gouge or punch when two or three months old, and with full-grown animals the horn is sawn off at the point where the matrix joins the bone horn, and should be done early in the spring. If sawn higher up, the horn grows again; if below, the process of granulation would not take place."

Broken Horns.

If the horn is severely crushed, it is best to amputate it; but in cases where it is only torn or broken off, wash clean, smear some Archangel tar over it, wrap some tow around, and take a long linen bandage and wind around the horns in the figure-of-8 style.

Ophthalmia. Inflammation of the Eyes.

The symptoms and treatment of the diseases affecting the eyes are practically the same as those given in the section on Horses (see p. 446).

Growth on Eyeball.

There is sometimes seen in cattle a growth on the eyeball: this can easily be removed by cutting it off with a pair of scissors, afterwards touch with nitrate of silver.

DISEASES AFFECTING THE THROAT, CHEST, RESPIRATORY ORGANS, AND BLOOD.

Abscesses.

Symptoms.—Frequently large lumps appear on the side of the jaw or on other parts of the body. In time they burst and discharge a large amount of matter, often affecting the health of the animal.

Cause.—Generally a blow, prick, or other injury.

Treatment.—A mild purgative (No. 28) should be given in gruel, and the abscess should be fomented with hot water, and opened as soon as it is ready. If making little or no progress, it should be rubbed with blister (No. 22). Tonic (No. 29) may be given in a pint of warm ale morning and evening when recovering.

Anthrax or Splenic Apoplexy.

A disease of the blood (see p. 452). Diseases generally regarded as allied to anthrax—namely, Black-leg, quarter-ill, joint-ill, black-quarter, quarter-felon, blood-striking, inflammatory fever, hyan, &c.—are usually confined to animals under two years old, while anthrax attacks animals of all ages indiscriminately.

Symptoms.—These diseases usually affect cattle under two years old, and are most prevalent in the spring. The animal will first separate itself from the others, lie down, shiver, lose its appetite, pulse feeble and rapid, mouth hot and dry, lameness and stiffness. Hot and painful swellings appear on the loins, neck, or limbs, afterwards becoming cold, painless, and tympanitic, and containing a dark bloody fluid. The urine becomes bloody and the dung fœtid. Death will often ensue after an illness lasting from a few hours to several days.

Cause.—These diseases, concerning which at the best little is known, are most prevalent in spring when the grass is flushed and the weather changeable. Cold wet districts are peculiarly subject to them, and certain farms are more liable to them than others.

Prevention.—A seton in the dewlap is the most common preventive. In many herds calves are always setoned in the spring of the year. Salt should be given, 1½ oz. daily, and care taken to remove the herd to poor pastures if the disease makes its appearance. Inoculation as a preventive is now being experimented on.

Treatment.—Foment the swellings on the limbs with hot water, and rub well with liniment (No. 26). Every six hours give, in gruel, sulphite of sodium, ½ oz.; salicylate of sodium, ½ oz.; and Fleming's tincture of aconite, 15 drops. Wash the ulcers with chloride of lime, ½ oz., in a quart of water.

Bury the dead body at once, and cover with quicklime to prevent infection.

Cattle Plague or Rinderpest.

An acute, specific, contagious fever.

Symptoms.—Weakness, shivering, cold feet and horns, short breathing, red eyes, mucous discharge from nostrils, sore places on the inner side of the lips and roof of the mouth, diarrhœa, aversion to green food, loss of appetite. In the advanced stage the body is distended, and while at first there is constipation, it gives way to profuse and fœtid diarrhœa.

Cause.—It is indigenous to the steppes and elevated regions of Central Asia, and is always due to contagion in Britain.

Prevention.—During the cattle-plague epidemic all kinds of disinfectants and precautions were tried, with varying success. Carbolic acid and water is the most powerful disinfectant, and, combined with the isolation of infected beasts, may do much to prevent the disease spreading.

Treatment.—Immediately slaughter any beast affected with the disease, and thoroughly disinfect the premises.

Choking.

Very often cattle get pieces of turnips or linseed-cake into their throat, especially if the turnips are cut in large pieces.

Symptoms.—Animal ceases to feed, nose poked out, saliva flows from the mouth; the animal in time becomes hoven, and frequently dungs. If it is choked by a piece of turnip, you can smell it in the breath, and if the piece is near the larynx there may be coughing.

Treatment.—Give a pint of linseed-oil very slowly. If this does not pass it on, you must use the probang. In using this instrument you must first place the gag in the animal's mouth, and have it held there by two men, who cross their hands, holding the gag in one and grasping a horn with the other; then take the probang, oil it well, and gently pass it down the throat until you reach the offending body. Do not use much force in passing it into the stomach, for it is an easy thing to rupture the gullet. If it cannot be moved by the probang, it must be cut down upon and extracted by a veterinary surgeon.

Cold or Common Catarrh.

Symptoms. — Dulness; running discharge from the nose; cough; watering eyes; loss of appetite.

Cause. — This common complaint is most frequently met with in spring and autumn; it arises from exposure to draughts and from chills caught in wet weather. If neglected, it will lay the foundation of serious coughs, inflammation of the lungs, and other formidable diseases.

Treatment.—Epsom salts, 1 lb., and ginger, ½ oz., may be given at first in warm gruel; afterwards, morning and evening, in gruel, solution of acetate ammonia, 4 oz.; bicarbonate of potassium, 1 oz.; spirit of chloroform, ½ oz. All drinking-water to be given with the chill off; and feed on bran-mashes and green meat.

Sore Throat or Quinsy.

Inflammation of the mucous membrane of the throat.

Symptoms. — The animal refuses to feed, pokes its nose out, breathes hard, and makes a peculiar noise in the throat.

Cause.—Cold and an insanitary condition of the byre, associated with bad feeding.

Treatment—Blister with No. 22, and place a piece about the size of a bean of the following every three hours between the molar teeth: extract of belladonna and chlorate of potash of each an ounce, and made into a paste.

Consumption,

or chronic disease of the lungs, arising from a tuberculated state of the lungs.

Symptoms.—Loss of condition, cough, which is at first clear, but gradually becomes shorter, weaker, and more painful. Appetite unaffected. After a time the breath becomes offensive, diarrhœa becomes constant, and the dung fœtid; the skin dry and scaly, the loins tender, and the whole system disordered.

Cause.—Hereditary; neglected cold, influences of climate, and close, badly ventilated cow-house. It is now known to be due to the irritation set up in the tissues by the presence of a bacillus—the *Bacillus tuberculosis*, or, as it is often called after its discoverer, Koch's Bacillus.

Treatment.—The object in view is to prevent the confirmation of the disease; taken in time the cough will often disappear, and the beast recover perfect health. In advanced stages death will probably result. If the beast is in good condition and fit for the butcher, I should strongly recommend it to be slaughtered; if otherwise, remove into a cool, well-ventilated box, feed on the most nourishing food, give porridge made of linseed-meal, and water in which linseed has been boiled instead of pure water for drinking. Twice daily give, in gruel or water, draught (No. 25). Frequently rub the throat and chest with liniment (No. 26). When recovery takes place, the beast should be fed for the market as quickly as possible; it will not be suitable for breeding.

Cough.

Cause. — Neglected colds are apt to develop into coughs which are difficult to cure. Cold caught when the system is relaxed, as is the case with cows after calving, may take the form of a cough which will settle on the lungs and produce serious consequences.

Treatment.—Keep the animal warm; give water in which linseed has been boiled for drinking purposes, and morning and evening, in gruel, draught (No. 25).

Foot-and-mouth Disease.

A specific, contagious, eruptive fever.

Symptoms.—Shivering, staring coat, fever, quick pulse, weakness, loss of appetite, tenderness over the loins, tenderness of the jaws, profuse discharge of stringy saliva, generally accompanied by smacking of the lips. Vesicles on the lips and tongue; sometimes vesicles on the feet, udder, and between the toes. Pain and lameness. There is a peculiar smacking noise made by the mouth, which is very characteristic, and a movement of the affected feet resembling an attempt to kick the hoof off. In mild cases the attack is soon over, and in a week the animal will be well. In aggravated cases the constitution is much reduced, strength being rapidly lost. Pregnant animals often suffer abortion.

Cause.—Contagion. The germs of the disease may be carried by the wind from place to place and retain their vitality for a long period.

Prevention. — Under the Foot-and-Mouth Disease Order, complete quarantine of infected areas and powers for compulsory slaughter served as the best means of preventing the disease spreading. The liberal use of carbolic acid and water among the cattle is a valuable preventive.

Treatment.—Completely isolate the cattle. Give, morning and evening, sulphite of sodium, 3 drs., dissolved in water, and place in the crib some fine meal, which will induce the animals to lick a little without increasing the irritation of the mouth. If constipated, give Epsom salts, 12 oz., in water. Apply ointment of boric acid between the claws of the feet and the teats, if sore. Water in which linseed has been boiled is useful for drinking purposes. A useful medicine is chlorate of potassium, ½ oz.; camphorated spirits of wine, 1 oz., in a quart of water, to be given daily. Trouble must be taken to induce the animal to eat hay, small pieces of oil-cake, and cut grass.

Hoose or Husk

is a peculiar disease produced by the thread-worm or lung parasite of cattle—the *Strongylus micrurus*.

Symptoms. — Peculiar short cough, wheezing, loss of condition, and death, if means are not taken to remove the thread-worms in the bronchial tubes. In the later stages of the disease there is much slimy mucus about the mouth and nose. It is very prevalent among calves and growing stock during the first summer out of doors, and especially so in the autumn when the weather is wet. The cough is particularly noticeable if the animals are chased.

Cause — Prevention. — The losses caused by these parasites render it most important that every care should be taken to keep animals likely to be affected free from the influences calculated to invite an attack. These parasites frequent low, marshy, and undrained ground. During a wet season any kind of grass-land will be found to contain them. Calves and young stock should be kept in good condition, and, if possible, during the autumn should be housed at night, and not turned out till the dew is off the grass. This is the surest preventive.

Treatment.—Stock in the autumn should be daily examined, and upon the first sound of husk the affected beast should be attended to. Give daily to a calf turpentine, ½ oz., beaten up with milk and an egg; keep him well, giving linseed-porridge; and if the calf is young, new milk. In the case of older cattle, give morning and night turpentine, 1 oz., in six times the quantity of sweet oil. I have tried applications of tar to the animals' noses, but they do no good. A new method of treating this disease is to inject remedies directly into the windpipe, but this should be left to a competent veterinary surgeon.

Bronchitis.

Inflammation of the small air-tubes of the lungs.

Symptoms. — Animal dull, breathes quick and short, fits of coughing, and, on placing the ear against the chest, a peculiar wheezing noise is heard.

Cause.—Cold, exposure to wet, and allowing medicine to get into the windpipe in the act of drenching an animal.

Treatment.—Remove to a warm box, throw a couple of sacks over its back, rub each side of the chest with embroca-

tion (No. 12), and give in a pint of gruel twice a-day (No. 25).

Inflammation of the Lungs or Pneumonia.

Symptoms.—Dulness, loss of appetite, cough dry and hard, rapid breathing, hot mouth, very cold ears, horns, and feet, slimy discharge from mouth.

Cause.—Exposure to cold and sudden chills.

Treatment. — Remove into a cool loose-box, and give every six hours, in a pint of gruel, Fleming's tincture of aconite, 20 drops; solution acetate of ammonia, 4 oz.; spirit of nitrous ether, ½ oz. Feed on mashes and green food; rub the chest repeatedly with blister (No. 23). If the bowels are costive, give in gruel Epsom salts in 1-lb. doses. Clothe with rugs or sacks about the shoulders and chest.

Influenza or Epidemic Catarrh.

Symptoms.—All the symptoms attending common colds are intensified in the more serious form of influenza. Profuse discharge from eyes and nose, painful cough, obstinate constipation, fever, followed by equally obstinate diarrhœa; swellings about the head, accompanied by great weakness. Usually the disease runs through a herd, and is attended with considerable loss among the cattle.

Cause.—Influences of climate, which seem to make the disease an epidemic.

Treatment. — Isolate the affected beasts. Give linseed-oil, 1½ pint, followed by gruel to drink; if constipation continues, give enemas and every six hours a draught containing acetate of ammonium, 4 oz.; bicarbonate of potash, 1 oz.; spirit of chloroform, ½ oz. Keep the body warm, and for drinking purposes give water in which a little linseed has been boiled. Feed on mashes and green food.

Murrain, or Gargle, or Malignant Catarrh.

Symptoms.—This disease, which is one of the most contagious and fatal to which cattle are subject, usually begins with a cough, followed by heaving flanks, shivering, tenderness over the loins, horns cold, dung hard, black, and fœtid, bloody matter running from the nose. As the disease advances, blood is mixed with the dung, and the breath becomes offensive. Great weakness sets in, the mouth becomes ulcerated, till finally the beast dies, a mass of corruption.

Cause.—Contagion or epidemic.

Treatment.—If this dreadful disease is suspected, completely isolate the beast; give every four hours, in warm gruel, salicylic acid, 3 drs.; tincture of cinchona, 2 oz.; brandy, 4 oz., till the opinion of a veterinary surgeon can be obtained, who will decide whether to slaughter the beast or not.

Contagious Pleuro-pneumonia.

An infectious lung disease confined to the ox tribe, which must not be confounded with ordinary inflammation of the lungs. It is a combination of inflammation of the lungs and pleurisy.

This destructive and contagious disease often remains latent in a beast for a long time, and sometimes is not discovered till it is slaughtered, when it is found some part of the lungs is almost entirely gone. When, however, the beast is not strong enough to withstand the disease after its development, it is very rapid in its progress, and death may result in forty-eight hours.

Symptoms.—An acute attack commences with a hard dry cough, dry muzzle, hot mouth, excessive thirst, loss of appetite, rough coat, weakness and often lameness of the hind quarters, heaving flanks, dung dry, black, and fœtid. As the disease develops, the cough becomes painful, and a frothy mucus runs from the mouth; the breath may become offensive; the dung watery; and the beast dies a mere skeleton.

Cause.—The primary cause is contagion; but its spread and development is favoured by exposure to cold, neglect, and dirt. It has been introduced into this country by direct infection from abroad. Cattle sales and markets have always been the most active centres of the disease, from which it has been spread over the country by contagion.

Prevention.—The only means is the isolation and slaughter of the beasts affected, and the free use of such disinfectants as chloride of lime in the cow-sheds, stalls, &c.

Inoculation.—Inoculation as a preventive to pleuro-pneumonia is a somewhat ancient remedy, and has been tried in various countries, but has not been very successful.

Treatment.—Should the disease be suspected, a veterinary surgeon should be called in, and if he pronounces it to be pleuro-pneumonia, it must be at once reported to the police.

DISEASES AFFECTING THE STOMACH, LIVER, BOWELS, KIDNEYS, AND INTERNAL ORGANS.

Bloody Flux, see *Dysentery* (p. 477).

Colic or Gripes

is of two kinds.

1. *Flatulent Colic.*

Arising from retention of food in the third stomach and bowels.

Symptoms. — Fever, moaning, and pain; discharge of gas from anus, swelling on right side of the belly, restlessness.

Cause.—Costiveness, produced by dry food, or overfeeding on dry meal or hay.

Treatment.—Give purgative (No. 27) in gruel, and every four hours, in gruel, solution of ammonia, 1 oz.; spirit of chloroform, 1 oz. Give gentle exercise, and rub the belly with liniment (No. 26). Glyster of warm water may be necessary. Feed on mashes and gruel.

2. *Simple Colic.*

Symptoms. — Spasmodic attacks of pain, increasing in violence. Irritability, and constant striking of the belly with the hind legs or horns; continual restlessness.

Cause. — Chills from drinking cold water when heated; improper food.

Treatment.—Give linseed-oil, 1 pint, repeating the dose if there is costiveness; and every four hours give in gruel: oil of turpentine, ½ oz.; tincture of opium, 1½ oz.; spirit nitrous ether, 2 oz. Walk the animal about. In obstinate cases send for a veterinary surgeon, and in the meantime rub the belly with liniment (No. 26).

Costiveness or Fardel-bound.

Symptoms. — Excessive costiveness; dung hard, and at intervals loose and slimy. Frequently the body will swell. Inflammation follows, and loss of appetite.

Cause.—Excess of dryness in the food, or the peculiar properties of some kind of underwood often eaten by cattle. Often also a symptom of some other disease.

Treatment.—Give linseed-oil, 1 pint; and warm oatmeal-gruel, in which ½ oz. salt has been mixed. If this does not act, give, in gruel, purgative (No. 27), and, if necessary, a warm glyster of gruel and ½ oz. salt.

Foreign Bodies in the Paunch.

Some cows at times suffer from depraved appetites, and pick up almost anything that comes in their way. Leather, wire, cutlery, rags, &c., have been found in the paunch of an animal.

Symptoms.—They are not very noticeable, and an animal might have a foreign body in its paunch for months without feeling any inconvenience from it, but if the foreign body passes into any vital organ, symptoms such as loss of appetite and colicky pains are soon noticed.

Treatment.—Nothing can do any good in the shape of medicines; if you are sure there is something in the stomach that should not be, you must cut through the left side and take it out.

Diarrhœa.

Symptoms.—A frequent discharge of fluid dung mixed with mucus, which soon causes great weakness.

Cause.—Change of food, especially when moved from a poor into a luxuriant pasture. Bad water or atmospheric influence, amounting almost to an epidemic.

Treatment.—Give linseed-oil, 1 pint; tincture of opium, 1½ oz.; oil of turpentine, ½ oz., and repeat the dose, if necessary, which will remove any cause of irritation in the intestines: till this is done, no astringent should be given. When the oil has cleared the system, give morning and evening, in cold gruel: powdered opium, 2 drs.; catechu, 4 drs.; galls, powdered, 4 drs.; prepared chalk, 1 oz. Looseness of the bowels, unattended with pain and weakness, should not be regarded as serious, provided it can be accounted for by change of food; it should be carefully watched, and steps taken to prevent its assuming too violent a character.

Dysentery or Bloody Flux.

Symptoms.—Continual and obstinate purging, the animal is hide-bound, eyes pale, pulse weak, extreme weakness. In time the dung appears like undigested food, and water with clots of blood in it.

Cause.—Internal inflammation from neglected diarrhœa.

Treatment.—Clothe warmly, foment and rub the belly with liniment (No. 26). Feed on gruel made of oatmeal and linseed, with 4 oz. of starch and 1 oz. nitre in it. Give three times a-day in gruel: ipecacuanha, 1 dr.; chlorodyne, 40 drops; opium, 2 drs.; chalk, 1 oz.; galls, 2 oz. Give also cold glysters of oatmeal-gruel; and laudanum, 2 drs. This disease is most dangerous and almost hopeless.

Gripes, see *Colic* (p. 476).

Hoove, Hove, or Hoven,

or distention of the stomach by gas, owing to the food being retained in the stomach so long that it begins to ferment.

Symptoms.—Swelling of the belly; heavy breathing; moaning and unwillingness to move. As the gas is evolved, the stomach becomes further distended, there is even danger of the paunch bursting; the circulation of the blood is impeded; gradually suffocation sets in, till at length the beast falls and dies.

Cause.—Overloading of the stomach so that it is unable to react on its contents, greedy feeding on green food, feeding on clover before the dew is off it, hence it is often termed—dew-blown.

Treatment.—In desperate cases the only cure is to relieve the stomach by means of a stomach-pump, which will be almost beyond an ordinary breeder of stock. In cases of sudden emergency, an incision into the paunch behind the short ribs with a penknife will give relief. A trocar and canula should be used if it can be got. In ordinary cases give at once in a pint of water hyposulphate of soda, 4 oz., repeating the dose till relief is afforded. When recovering, Epsom salts, 1 lb., and ginger, ½ oz., may be given, and but little food allowed till the digestive organs have recovered their strength.

Impaction of the Paunch, or Grain-sick.

This disease is seen when animals are allowed to gorge themselves with such foods as succulent grass, chaff, potatoes, turnips, and grains.

Symptoms.—Animal dull, refuses food; disinclined to move and generally lying down; greatly swollen on the left side, but, unlike hoove, it has a doughy feel.

Treatment.—Give purge (No. 27), and with it 1 pint of linseed-oil and 2 oz. of tincture of nux vomica; if this fails, you must get a veterinary surgeon to perform an operation to remove it.

Inflammation of the Bowels.

Symptoms.—Restlessness, pain, perspiration, hard breathing, quick pulse.

Cause.—Sudden chills in hot weather, as from drinking a great quantity of cold water when overheated.

Treatment.—Give, morning and evening, linseed-oil, ½ pint; spirit of nitrous ether, 1 oz.; tincture of opium, 1 oz.; and repeat the dose of spirit of nitrous ether and tincture of opium in a little gruel every four hours.

Dropsy of the Belly.

An accumulation of fluid in the abdomen.

Symptoms.—The beast increases slowly in size; the swelling is on both sides and on the lower part of the abdomen; as the fluid increases the breathing becomes hurried, belly hangs low, the animal looks thin, and if you force your fist against the side of the belly you feel the impulse of the returning water against it.

Cause.—Debility and organic disease of the liver or spleen.

Treatment.—The chance of success in treatment is not great, for the only thing to be done is to tap the abdomen with a trocar and canula to let the fluid out, and if it again accumulates the case is hopeless.

Inflammation of the Fourth Stomach.

Symptoms.—Uneasiness, pawing of the ground, striking of the belly with the feet, showing where the pain is located; dung thin and offensive; pulse hard and quick; breathing accelerated; alternately hot and cold shivering fits.

Cause.—Unwholesome or poisonous food; change from a poor to a rich pasture; prolonged indigestion.

Treatment.—Feed on bran-mashes, but no green food; give linseed-oil, 1 pint; and every six hours, in gruel, tincture of opium, 2 oz.; Fleming's tincture of aconite, 30 drops; spirit of chloroform, 1 oz. The belly may be frequently rubbed with liniment (No. 26).

Gut Tie.

It is only seen in castrated animals, and generally terminates fatally.

Symptoms.—It is usually seen at the age of two or three, rarely before. The animal at first appears dull and loses its cud; after a time colicky pains appear, it strikes its belly with hind legs, goes stiff, breathing becomes hurried, the animal wears an anxious expression, no medicine seems to do any good, and in a few days it dies in great agony.

Cause.—The cord of the testicle encircling a portion of the small intestines and strangulating it.

Treatment.—There is only one thing to be done, and that is, cut into the right side, introduce the hand, and release the imprisoned gut.

Inflammation of the Kidneys.

Symptoms.—Straining to void urine, which is forcibly ejected in small quantities; loins tender and hot. After a time blood and pus may be mixed with the urine and the straining increases; muzzle becomes dry, horns cold, breathing quick. Diarrhœa follows, dung becomes fœtid; pain increases, total suppression of urine takes place, and the animal will die in about three days.

Cause.—Unwholesome food or a chill which has produced inflammation in this particular part.

Treatment.—Foment the loins with hot water, and rub in mustard mixed with water; give glyster of warm gruel with 2 oz. salt in it, adding tincture of opium, 1½ oz., if straining continues. Give at once, in gruel, purgative (No. 27), and three times a-day give, in gruel, a draught containing Fleming's tincture of aconite, 20 drops; solution acetate of ammonium, 3 oz.; and tincture of opium, 1 oz.

Inflammation of the Liver (Yellows or Jaundice).

Symptoms.—Yellowness of the eyes and skin; pulse quick; ears and horns hot; muzzle dry; shivering of the right side; stiffness, fulness of the belly; pain when the right side is pressed; urine and dung light brown in colour.

Cause.—Over-fattening; driving in hot weather; injury to the body near the liver, impeding circulation and inducing inflammation.

Treatment.—Give in warm water purgative (No. 27), and feed on bran-mashes. Morning and evening give in warm water chloride of ammonium, 4 drs.; bicarbonate of potassium, 1 oz.; ginger, 4 drs. Keep free from draughts. The animal should be sold when occasion offers; it is never likely to do well after the attack.

Flukes in Liver.

Cattle, like sheep, suffer from flukes in their livers, but not so severely, and it is rarely discovered until their death.

The reasons for cattle not suffering so severely as sheep are—firstly, they do not feed so close to the ground, and thus pick up fewer fluke-eggs; and, secondly, their livers are larger, and can stand the ravages of the fluke better.

Loss of Cud.

Symptoms.—Very often cattle do not chew their cud properly, and a great quantity of saliva dribbles from their mouth.

Cause.—Indigestion.

Treatment.—Change the food, and give a dose of linseed-oil, 1 pint, and, in the case of a calf, give oatmeal-porridge with bicarbonate of soda, 1 dr., night and morning. A little salt thrown with the food will help to remedy the evil.

Poisons.

The poisons that cattle usually suffer from are yew, rhododendron, arsenic, mercury, and lead.

Yew-poisoning

is perhaps most frequently met with.

Symptoms are those of a virulent poison, and is rapidly fatal. The animal usually dies in a few hours.

Cause.—By animals being allowed to graze in the vicinity of yew-trees, or by the trimmings of these trees being thrown within their reach.

Rhododendron-poisoning.

Symptoms.—This poison is not so quick in its action; the animal staggers, becomes partially paralysed, colicky pains; animal lies and moans and frequently vomits, the vomit being greenish in colour.

Cause.—Same as yew.

Treatment.—The treatment of these two vegetable poisons are identical. Open the stomach and remove the poisonous stems and leaves, then give purge (No. 28) and half a pint of brandy in some water every three hours.

Arsenic-poisoning.

Symptoms.—Great prostration, shivering, colicky pains, diarrhœa, and death.

Cause.—In being given by accident, and by grazing on land where recently dipped sheep have been lying.

Treatment.—Give the following in a pint of water every hour: dialised iron, 1 oz.; brandy, 6 oz.

Mercury-poisoning.

Symptoms.—Flow of saliva from the mouth, breath fœtid, gums red and tender, colicky pains, and appetite lost.

Cause.—By dressing cattle with mercurial preparations to cure mange and warbles.

Treatment.—Give purge (No. 28) with half-a-dozen eggs, and follow every two hours with iodide of potassium, 2 drs.; opium powder, 2 drs., in gruel.

Lead-poisoning.

Symptoms.—Animal dull, abdomen tucked up, eyes staring, unsteady gait, bowels constipated, swelling under jaw, and emaciation.

Cause.—Grazing near smelting furnaces or rifle-butts, and by eating red paint or tea-lead.

Treatment.—Use the stomach-pump, afterwards give the following in a quart of water: sulphate of magnesia, 1 lb.; sulphuric acid dil., 3 drs. Give every three hours the following: iodide of potassium, 2 drs.; sulphuric acid dil., 3 drs.; 3 eggs; and half a pint of water.

Red Water.

When in an acute form, it is often called Black Water.

Symptoms.—The first thing that draws attention to the animal is usually the red colour of the urine, which froths when it falls to the ground; this is generally accompanied by diarrhœa or scouring, which soon gives way to constipation. The urine gets darker, the appetite fails, the animal gets weaker, and the heart can frequently be heard beating while standing behind the animal. Death often ensues within three or four days.

Cause.—It is not very well known. It is most common in milk cows, occurring generally from ten to fifteen days after calving. But in some districts when it is very common it attacks bulls, oxen, and heifers as well, and at all seasons. Too many turnips have been blamed for it, and particular plants growing in some soils. Undoubtedly it is most common on moorland soils, and where there is a wet retentive subsoil.

Prevention.—Careful feeding after calving, a limited supply of turnips, some linseed-cake, and other foods allowed. Thorough draining and manuring of the land.

Treatment.—If observed before the appetite and rumination are diminished, give in gruel: Epsom salts, 16 oz., and ginger, ½ oz., but not otherwise; and morning and evening give tincture of perchloride of iron, 1½ oz.; spirit of chloroform, ½ oz., in gruel, and give milk, raw eggs, and stimulants if appetite lost.

Yellows, see *Inflammation of the Liver* (p. 478).

Bleeding.

Cattle are bled from the following veins: jugular, the vein below the eye, and the milk-vein. The jugular is usually opened in cases of milk-fever, apoplexy, &c., and is easily got at on either side of the neck. First raise the vein by placing a rope tightly around the neck, turn the neck a little to the opposite side, and a sharp blow will send the fleam through the skin into the vein. The fleam should be a size larger than that used for a horse. Afterwards, close

the wound with a pin, and twist tow around it. The vein below the eye is opened with a lance in cases of inflammation of the eye, and the milk-vein in cases of inflammation of the udder. Two quarts of blood is a fair quantity to take from an animal.

DISEASES AFFECTING THE PARTURITION AND MILKING ORGANS.

Abortion.

Symptoms. — When abortion takes place in early stages of gestation, as it often does in the second month, the symptoms are very slight, and may be passed unnoticed, especially in the summer when the cattle are at grass. In the later stages of gestation, the symptoms are easily recognised. There is restlessness and derangement of health, the udder becomes enlarged, accompanied by calving pains, and discharge from the vagina. But frequently the first symptom is the appearance of the calf.

Cause.—There is so much uncertainty connected with this disease, that it is sufficient to remark here that blows, injuries, exposure to cold, improper food, foul smells, and overdriving are the most immediate causes. But there are some forms of abortion that, once started in a herd of cows, are to all appearance communicable by contagion.

Prevention.—Careful attention, good water, and the removal of any existing influence will do much to make the occurrence of the disease rare. A goat allowed to run amongst the cows is a good preventive. Have the cow isolated as soon as observed, before abortion if possible, and attend to the thorough cleansing and disinfection of everything with which the calf or the discharges could have come in contact. And, lastly, the rejection for breeding purposes of any animal that has once aborted.

Treatment.—Should any symptoms of abortion appear, give Epsom salts, 12 oz.; Fleming's tincture of aconite, 10 drops; chloral hydrate, 1 oz., in a pint of warm water, and repeat the dose of aconite in a half-pint of water three times a-day if there is no improvement. Bury the fœtus at once, and if it takes place in a field, remove any cattle in it to another pasture.

Calving, see *Parturition* (p. 482).

Cow-pox.

Symptoms.—Small ulcers or pustules on the teats, which, when large, produce inflammation and affect the health.

Cause.—Constitutional, and contagion from other cows, carried by the milker's hand.

Treatment. — Give purgative (No. 28); keep the teats clean, and bathe them with goulard water, or chloride of lime, ½ oz., dissolved in half-gallon of water. The pustules will soon heal.

Bull-burnt or Clap.

This is a contagious disease of the genital organ, and is propagated through copulation.

Symptoms. — In the cow a glairy discharge is seen coming from the vagina a few days after being bulled; in the bull this discharge is seen issuing from the penis.

Treatment.—Inject into the vagina twice a-day a little of the following, after syringing with lukewarm water: liquor *opium sedativus*, 1 oz.; sulphate of zinc, ½ oz.; water, 1 quart. In the case of the bull, it must be injected into the sheath. Give the animal purgative (No. 28) now and then to keep its bowels open.

Falling Down of the Calf-bed.

Symptoms.—After calving, the womb sometimes follows the calf, and hangs down like a large red bag.

Treatment. — Return the womb as soon as possible, having first dressed it with lotion composed of extract of belladonna, 1 part; water, 30 parts. Give a draught in warm gruel containing tincture of opium, 2 oz.; chloral hydrate, 1 oz.; spirit of chloroform, 1 oz. Raise the animal higher behind than in front. Afterwards place a truss on the animal to keep it in.

Flooding after Calving.

A flow of blood from the womb.

Cause. — Rupture of some of the vessels of the womb through using force in extracting a calf.

Treatment. — Keep the cow higher behind than in front; place ice or cold-water cloths across the loins; give every

three hours in a pint of cold water the following: tincture of perchloride of iron, ½ oz.; tincture of opium, 1 oz.; and tincture of ergot, 2 oz.

Garget,

or inflammation of the internal part of the udder.

Symptoms. — This is a very serious disease, and often attacks young cows after their first calf, and if the inflammation is not reduced, the milk will become discoloured, the health and appetite affected, and the cow may be lost.

Cause.—Careless milking; too hasty drying of the cow; injury to the udder; lying on cold wet land in the autumn.

Prevention. — Should there be any appearance of the disease, the calf should, if possible, be put to the mother, and it will, by its sucking and bumping, speedily relieve her of the pressure of milk and disperse the lumps.

Treatment. — Should the disease become established, draw off gently all the milk at frequent intervals, and apply linseed-poultices to the bag, containing belladonna, 3 drs. Give four times a-day, in gruel, bicarbonate of potassium, 1 oz.; Fleming's tincture of aconite, 10 drops. Should ulcers form and break, they should be dressed with lotion containing carbolic acid, 1 part; water, 20 parts.

Overstocking or Hefting.

This is not a disease, but the consequence of the cruel practice of placing an elastic band around the teats, or plugging them up with grains of barley, and not milking the animal for twenty-four to thirty-six hours, with the result that the animal arrives in the market with a beautiful udder, and the owner tries to get more for the cow than she is worth. The results of overstocking are intense suffering of the animal, inflammation of the udder, and a permanent interference with the secretion of milk.

Hard Udder.

Cows' udders frequently become hard, especially with heifers after their first calf.

Symptoms.—Swelling and inflammation.

Treatment.—Rub a little goose-grease on the udder after each milking, and if there is much tenderness give purgative (No. 28) in gruel.

Bloody Milk.

Symptoms.—Generally the first and only symptom is the presence of blood in the milk, and it is very often confined to one teat. The udder may neither be hard nor painful. This disease is especially prevalent among young cows after the first calf.

Cause.—Injuries to the udder; sudden change to a rich milk-producing diet; chills; too hasty drying of the cow; careless milking, &c., &c.

Treatment.—Give Epsom salts, 1 lb.; nitre, 1 oz.; and ginger, 1 oz. Follow with tonic (No. 21). Milk the affected teat or teats into separate vessels.

Warts on Teats.

These little but troublesome things can easily be removed by winding green silk around them and allowing them to drop off; or by cutting them off with a pair of scissors, afterwards touching the parts with nitrate of silver.

Inflammation of the Womb.

Symptoms.—After calving, inflammation of the womb sometimes sets in, causing fever and loss of milk, accompanied by inflammation of the bladder, and a fœtid discharge from the uterus; sometimes the discharge from the uterus is suppressed. There is generally pain, fever, stiffness, straggling gait, and straining.

Cause.—Generally injury done during parturition, either from violence used in the assistance given, or otherwise. High condition and improper rich food induce a tendency to this complaint.

Prevention.—A fortnight before calving, a cow's diet should be reduced to the simplest character. If the condition of the beast is very high, Epsom salts, 1 lb., and ½ oz. ginger in gruel, or a pint of linseed-oil, given a few days before calving, will do much to ensure safe recovery.

Treatment.—If there is difficulty in passing urine, the aid of a veterinary surgeon should be at once obtained. In the first stages of the disease give a warm glyster containing tincture of

opium, 2 oz. If constipation, give purgative (No. 27), and repeat in half-doses till the bowels are opened; then give every six hours in gruel, salicylate of sodium, 4 drs.; tincture of opium, 1½ oz.; solution acetate of ammonium, 4 oz., and rub the spine and loins with liniment (No. 26). Feed on mashes, and be careful not to allow the animal to get a chill.

The Whites.

Called so from the colour of the discharges.

Symptoms.—The cow is unthrifty, and a white discharge runs from the vagina, especially when she coughs or lies down.

Cause.—From injury to the womb, usually after difficult calving.

Treatment.—Give tonic (No. 29) night and morning in a pint of ale; inject into the vagina, by the aid of a syringe, the following twice a-day: sulpho-carbolas of zinc, ½ oz.; water, 1 quart; and feed the animal well.

Parturition or Calving.

The natural presentation of a calf is with the muzzle resting between the fore feet, with the back of the animal upwards. In cases of unnatural presentation, assistance will always be required. Every endeavour should be made to get the calf into a proper position. Experience and skill in extracting the calf is more needed than mere force. Every care must be taken not to wound the cow.

No description within the scope of the present treatise could give a proper idea of the methods used in all cases of unnatural presentation. The aid of an experienced surgeon must therefore always be obtained if the case is beyond the knowledge of the man in charge. Two or three hours after calving it may be prudent to give, in warm gruel, purgative (No. 28). Shortly after calving the cleansing or after-birth should come away. If retained more than twenty-four hours, with no appearance of coming away, it should be carefully removed before decomposition is too far advanced, as it very often sets up a septic or putrefactive inflammation; but if not removed, a draught in gruel containing Epsom salts, 8 oz.; powdered ergot, 1 oz.; carbonate of ammonia, 4 drs., should be given every day, unless diarrhœa supervene, until it appears. Should decomposition actually commence, the hand must be introduced, and the placenta removed as gently as possible.

Dropsy of the Womb.

An accumulation of fluid in the womb, and is often mistaken for pregnancy.

Symptoms.—The cow looks as though she were pregnant; but when her time is up—that is to say, if she has been to the bull—she shows no sign of calving, and if you place your hand up the rectum nothing but a huge water-bag can be felt.

Treatment consists of tapping the womb and allowing the fluid to escape.

Puerperal or Milk Fever (Dropping after Calving).

Symptoms. — After calving the cow will appear restless, muzzle hot and dry, udder tender and hot, constipation. Increasing weakness, ending in death, if the treatment is not successful. Sometimes cows have been known to suddenly drop down a few hours after calving without the herdsman previously knowing that anything was wrong.

Cause.—The origin of the disease is as yet not satisfactorily settled; there are many opinions, the enumeration of which would occupy too much space to be profitable for our present purpose.

Prevention. — A fortnight before calving keep the cow on a spare diet, composed in winter of bran-mashes and other opening food; a little linseed meal or cake will help to keep the bowels open. After calving, it has always been my practice to give a drink of thin gruel with 12 oz. Epsom salts in it; and should any signs of derangement appear, add Fleming's tincture of aconite, 10 drops; repeating the dose of aconite every six hours should signs of restlessness continue.

Treatment.—When once this disease is established, give linseed-oil, 2 pints; and every four hours a draught in gruel containing carbonate of ammonia, 4 drs.; powdered ergot, 1 oz.; whisky or brandy, 6 oz. Apply cold water to the head, but keep the body warm, as, if the cow is very ill, the temperature very often

falls below normal. Warm glyster of gruel, containing ½ lb. of Epsom salts, will help to loosen the bowels. The injection of olive-oil and liquor *opium sedativus*, one to seven, into the uterus, repeating the injection every twelve hours, has in some cases been tried with success in addition to the above treatment. This disease is a very dangerous one, and in many cases the animal will have to be slaughtered. If milk-fever does not come on before the end of the third day after calving, the cow may be held to be nearly out of danger.

Sore Teats.

Symptoms.—After calving, cows are liable to have sores or small cracks or chaps on the teats, making them very tender and painful.

Treatment.—Apply boracic acid ointment to the teats, having previously bathed them with warm water to remove all scabbiness and dirt.

Suppression of Urine.

Cows in calf are very subject to this complaint, in consequence of the pressure caused by the calf. It is also a symptom of several other diseases.

Treatment.—Keep the bowels open by giving in warm gruel purgative (No. 28), assisted by a glyster of warm gruel, and give till relieved, morning and evening, in gruel, tincture of perchloride of iron, 1 oz.; spirit of chloroform, ½ oz.

DISEASES AFFECTING THE LIMBS, FEET, AND SKIN.

Foul or Foot Rot.

Symptoms.—Cattle are very liable to this disease of the foot, which produces great lameness. There is a good deal of fœtid discharge from the cleft of the foot, also swelling of the ankle.

Cause.—Driving over rough roads or for long distances; injury from a prick, nail, or splinter; standing on moist and dirty bedding.

Treatment.—Put the beast into a dry, clean place. Dress down the diseased hoof with a knife, and wash with hot water and soda. If there is pain and fever, and the lameness excessive, poultice for some days to reduce the inflammation. Then dress the feet with a mixture of gas-tar and powdered sulphate of copper. Should much swelling of the ankle with some lameness remain, apply blister (No. 23). If there is a wound in the foot caused by a splinter, apply a hot poultice of linseed-meal and bind up the foot.

Enlarged Knees.

Cows in byres frequently suffer from an enlargement on the front of the knee through lying on the stony floor.

Treatment.—If there is much pain and swelling, apply warm fomentations assiduously, and cooling lotion (No. 7). See that the knees are protected from the hard floor and from the manger.

Lice.

Symptoms.—Cattle in poor condition often lose their hair, especially on the neck and back, owing to their being infested with lice.

Cause.—Want of cleanliness and poor condition.

Treatment.—Wash the part affected with lotion made from tobacco, 4 drs., dissolved in 1 pint of hot water. Ointment made of lard, 6 oz., white precipitate of mercury, ½ oz., is a certain remedy, but requires careful handling. Improve the quality of the food and keep the animal clean; give tonic (No. 29).

Mange.

Symptoms.—Itching, loss of hair, scurf, scab, or sores, especially on the back.

Cause.—It is caused by a small insect (the *Acarus bovis*), and it is favoured by dirt, poverty of the blood, and neglect; and is very contagious when animals can get into contact.

Treatment.—Improve the food given, and keep the animal clean. Rub the places affected with ointment composed of sulphur, 1 oz.; lard, 4 oz.; give in gruel mild purgative (No. 28), adding sulphur, 1 oz. If this does not effect a cure, wash the places with corrosive sublimate, ½ oz.; muriatic acid, 1 oz.; soft water, 2 quarts; or by the treatment recommended for lice.

Rheumatism, Lumbago, Felon Chine.

Symptoms.—Swelling of the joints; stiffness; listlessness; unwillingness to move, which the beast does with pain.

Cause.—Cold, especially after calving or when weakened by illness.

Treatment.—Give a draught in gruel or warm water, morning and evening, containing carbonate of ammonia, 1 oz.; bicarbonate of potassium, 1 oz.; gentian, 1 oz.; ginger, 1 oz. Rub the parts affected with liniment of belladonna, 1 part, compound liniment of ammonia, 1 part. Give nourishing food and a little linseed meal or cake, and keep free from chills till quite cured.

Ringworm

is caused by a parasitic fungus growing in the skin.

Symptoms.—Loss of the hair, which comes off in circular patches, leaving a dry and scaly eruption. The face, neck, back, and root of the tail are the parts most generally affected.

Cause.—Contagion, neglect, and dirt.

Treatment.—If the animal is in high condition or out of health, give purgative (No. 28), and keep on nourishing food. Rub the parts affected with ointment composed of oleate of mercury, 1 part; lard, 2 parts, or use a lotion of perchloride mercury, 1 part; water, 500 parts. I have used lotions composed of sulphurous acid, but have found the mercurial ointment the most efficacious; sometimes a second application is not even necessary. Wash the cribs, rubbing-posts, &c., which have been used by a beast affected with ringworm with 1 pound chloride of lime dissolved in 2 gallons of water, to avoid spreading the disease among other stock.

Warbles.

Symptoms.—Early in the year and in the spring, from January till May, large lumps about the size of half-a-crown may often be found along the backs of cattle; these increase in size till the contents, the maggots of the bot-fly (*Œstrus bovis*), escape. There is always a small air-hole to be seen in the middle of the lump, and the head of the maggot is often visible.

Cause.—The bot-fly pierces the skin of the beast while out at grass during the hot weather in July and August, and leaves an egg at the bottom of the wound, which hatches, develops, and grows, till at length it emerges a large maggot about May or June in the following year.

Prevention.—None, except the extermination of the flies by diligent destruction of the maggots.

Treatment.—In April or May all cattle should be examined, and the maggots squeezed out between the fingers, which may easily be done, and in my opinion is the best way of ensuring their destruction. If the holes are smeared with M'Dougall's cattle-smear, the maggots are no doubt killed, but they remain in the ulcer, and certainly the most healthy way is simply to crush them out and relieve the beast of them at once.

The damage done by this fly to the cattle and the hides in the country may be estimated at millions of pounds; every means should therefore be taken to remove this pest from the country.

Wounds.

In severe cases, unless the animal has a fancy value, it would be better to slaughter at once. Simple cases may be cured by bringing the edges of the skin together, and fastening them with carbolised gut and a bandage of carbolised gauze. The bowels must be kept open by doses of purgative (No. 28), and the wound kept clean by bathing with warm water.

SPECIAL DISEASES AFFECTING CALVES.

Constipation.

Cause.—Frequently the first milk or biestings from the cow has not been given to the calf, and constipation ensues. Also, when milk has been taken to excess it is apt to coagulate and produce constipation.

Prevention.—In a young calf the natural first milk of the mother is most suitable, and afterwards care should be taken that only as much milk is given as the digestive organs can dispose of.

Treatment.—Give castor-oil, 1 oz., beaten up in the yolk of an egg, with ginger, 1 scr.; repeating the dose if necessary. Glysters may be required, but not so often as in young foals.

Diarrhœa.

Cause.—Injudicious feeding, and at too long intervals; bad smells, cold, acidity in the stomach, produced by any sudden change of food, or by anything which deranges digestion.

Prevention.—Care should be taken that the milk given to calves should be sweet, and that the air is kept pure.

Treatment.—If the calf refuses its food, and blood is mingled with the dung, accompanied by great pain and weakness, immediate steps must be taken to remove the irritating matter. Give castor-oil, 2 oz., to relieve the intestines, and after this has had time to act, give morning and evening 1 oz. of calf-cordial (No. 24). If this does not produce any effect, give four times daily, tincture of catechu, 2 drs.; spirit of chloroform, 30 drops; and dilute sulphuric acid, 30 drops, in thin gruel.

Diarrhœa, indigestion, and death are also caused by *hair balls*, which form in the stomach. There is no preventive. Caused by the calves licking each other.

Navel-ill.

Calves sometimes suck one another's navels, which causes swelling and inflammation of it; or it may be caused by the cord breaking off too short, by neglect, exposure to cold, wet, and dirt.

Treatment.—Poultice, if no tendency to bleeding, or apply hot fomentations persistently, and carbolic oil to the raw surface.

White Skit.

Whitish diarrhœa seen in calves that live on a milk diet.

Treatment.—Give castor-oil, 1 to 2 oz., according to the size of the animal, and follow up with calf-cordial (No. 24). Keep the animal for a few days on linseed or oatmeal gruel.

SHEEP.

DISEASES AFFECTING THE HEAD, EYES, MOUTH, AND NERVOUS SYSTEM.

Apoplexy.

This disease cannot be treated or guarded against; it attacks the fattest sheep on the richest pastures, especially in the spring of the year. The animal seized will drop down suddenly, and in extreme cases die at once. Any animal affected should be killed immediately.

Louping-ill or Trembles.

A disease of the nervous system.

Symptoms.—The animal trembles, breathes in a jerky manner, moves its legs in an automatic style, occasional spasms of the muscles of the neck, which usually terminate in paralysis.

Cause.—It is seen only in certain districts, and is supposed to be due to a peculiar formation of the soil or the condition of the grass.

Prevention.—Dip the sheep, remove them to fresh pasture, and give them corn and salt; to every pound of salt add one ounce of sulphate of iron.

Treatment.—Of little use; look to prevention.

Blindness.

Sheep are sometimes attacked by temporary blindness, often lasting only about ten days.

Cause.—Changes of temperature; blight.

Prevention.—None.

Treatment.—If left to nature, the blindness will probably pass away. Lambs thus affected require extra care, and should be put to the ewes so that they should not suffer from loss of milk.

Lockjaw or Tetanus.

Symptoms.—Practically the same as those in the case of the horse (p. 443).

Cause.—Cold, especially during lambing-time; also produced by careless castration, wounds, &c.

Prevention.—Shelter and careful attention will do much to avert this disease. (See pp. 443, 444.)

Treatment.—Give castor-oil, 2 oz., repeating the dose every six hours till it takes effect. Give, in gruel, tincture of opium, 1 dr., morning and evening. Fleming's tincture of aconite, 5 drops, may be added to the gruel if there is no relief.

Staggers, Sturdy, Goggles, Fern-sick, Dunt, or Turn-sick.

Symptoms.—Dulness; unsteady walk, generally in a circle; separation from

the rest of the flock; blindness. The animal affected will often fall into a ditch and perish, or die gradually. This disease generally attacks sheep in good condition.

Cause.—A species of parasite—the *Cœnurus cerebralis*—in cysts or bladders containing fluid, which lodge in the brain.

Prevention.—Young sheep in damp situations are very liable to this disease, and care should be taken to avoid putting them into such pastures. The use of lump or rock salt, which they can lick as often as they like, helps to ward off this and similar diseases. Keep your sheep-dog free from tape-worms, for it is the egg of this worm that gets into the brain.

Treatment.—Slaughter is the most profitable course to follow. There is a method of treating this disease by puncturing the soft place in the skull, and removing the bag or cyst; but unless this is done in good time, and performed skilfully, it is rarely successful.

Water on the Brain.

This disease often affects very young lambs.

Symptoms.—Dulness and stupidity; staggering gait; rapid loss of flesh. Death may ensue in about a month.

Cause. — Often congenital, taking place before birth; constitutional weakness.

Treatment.—No cure, so far as the farmer is concerned.

DISEASES AFFECTING THE THROAT, CHEST, RESPIRATORY ORGANS, AND BLOOD.

Anthrax.

See Anthrax (p. 472) for description of this disease. Sheep will die in convulsions in about twenty-four hours.

Catarrh.

Symptoms.—Dulness; loss of appetite; difficulty in swallowing; water running from the eyes and nose; hot mouth and muzzle; constipation; cough, and discharge of yellow mucus from the nose.

Cause.—Chills and exposure.

Treatment.—Give daily, in linseed gruel, nitre, 1 dr.; digitalis, 1 scr., and keep the animal warm.

Foot-and-mouth Disease.

A disease of the blood. (See p. 474.)

Symptoms.—Mouth hot, with small vesicles on the inside of it, dribbling saliva, swollen and painful legs. The udder and teats of ewes become sore and painful.

Cause.—Usually contagion.

Prevention. — Careful isolation of infected stock, and the free use of disinfectants, such as carbolic acid and water.

Treatment.—Give three times a-day, in warm water, sulphite of sodium, 1 dr. Apply carbolic acid ointment to the udder and teats, and the same or boracic acid ointment to the feet. Completely isolate all sheep affected, and induce them to eat fine meal and hay.

This disease comes under the Contagious Diseases Act.

Hoose or Husk.

Symptoms.—A short husky cough, which increases if the animal is hurried. Gradual loss of condition, till the health is undermined. In time the diseased lungs will no longer be able to purify the blood, and the animal will die.

Cause.—The presence of parasites—the *Strongylus filarius*—in the throat and lungs.

Prevention. — Lambs should never be depastured on land fed previously the same year with sheep. If this advice is acted on, and proper care taken of the flock, cases of hoose will be less frequent on most farms.

Treatment.—Give daily: turpentine, 1 dr., for a lamb; 3 drs. for a sheep, in respectively 6 and 12 drs. of sweet-oil, and feed liberally, giving some good linseed-cake with the food.

Pneumonia—Inflammation of the Lungs.

Symptoms.—Hard breathing; loss of appetite; fever; cough, which becomes more and more distressing; fœtid discharge from the nose; thirst. Afterwards intense weakness sets in, followed by unconsciousness and death.

Cause.—Cold, particularly from shearing in cold weather.

Treatment.—Give, in linseed-tea, Fleming's tincture of aconite, 5 drops, three times a-day, and with it once a-day tartar of antimony, ½ dr. Keep warm, and in cases of complete prostration, give, as a stimulant, in the gruel, gin, 1 or 2 oz.

Small-pox.

A very rare disease in this country.

Symptoms.—Loss of appetite; separation from the flock; stiffness of the hind quarters; costiveness; red patches on the limbs and stomach; later a small red eruption appears on the skin and face. In severe cases a great part of the flock may succumb to the disease; and when mildest it is a very serious malady.

Cause.—Contagion.

Prevention.—This disease should be stamped out and not treated; the animals attacked should be destroyed, and the premises disinfected.

DISEASES AFFECTING THE STOMACH, LIVER, BOWELS, KIDNEYS, AND INTERNAL ORGANS. PARTURITION AND MILKING ORGANS.

I.—STOMACH, LIVER, BOWELS, KIDNEYS, AND INTERNAL ORGANS.

Braxy or Sickness.

Symptoms.—Restlessness; hanging of the head; aching of the back; grinding of the teeth; cold extremities; kicking of the belly with the hind feet; separating from the rest of the flock.

Cause.—Inflammation of the bowels from cold or feeding on strong rank grass, some of which may have been rotten. Prevalent in the autumn, especially among the lambs; often runs through a flock like an epidemic.

Prevention.—If possible, keep the sound pastures for the lambs, and avoid letting them have too succulent pasture for grazing, and always let rock-salt be within reach. Don't allow an affected animal to be bled or slaughtered on ground that the rest of the flock have access to, as blood diseases of an anthracoid nature, as well as inflammation of the bowels, enteritis, and acute indigestion, are sometimes all included under the general name of braxy.

Treatment.—Give purgative (No. 34). Fleming's tincture of aconite, 5 drops, may be given in gruel every morning, and the food should be sparing, with a little linseed. The treatment of the disease is generally unsatisfactory. Change their pasture, and if on good arable grass, put them on the heather, if possible, for a day or two.

Calculus or Gall-stones, and Kindred Diseases of the Bladder.

Symptoms.—Dulness; loss of appetite; separation from the flock, generally lying down; quick breathing; when roused, painful efforts to void urine, only a few drops of which come away. Saline deposits will sometimes be found in the sheath.

Cause.—High and stimulating system of feeding, especially on saccharine roots, such as mangel-wurzel; want of exercise; absence of water for drinking.

Prevention.—Avoid an exclusively saccharine and starchy diet, and allow free access to water.

Treatment.—In the latter case warm fomentations and syringing with tepid water may get rid of the deposit; afterwards wash out the sheath with an astringent lotion. But if the seat of the malady cannot be reached, the sheep should be at once slaughtered when the disease is suspected.

Constipation.

Symptoms.—Dulness and costiveness.

Cause.—Especially prevalent among young lambs, caused by the quality or too great quantity of the ewes' milk, which has coagulated in the stomach.

Prevention.—Avoid any irregularity in the ewes' food, and especially too luxuriant pasture.

Treatment.—Put the ewes on shorter pasture, and give every morning as much warm water, with Epsom salts, 1 oz., dissolved in it, as the lamb can take.

Lambs also suffer from *wool balls*, which form in the stomach. There is no cure, but care should be taken that the bags of ewes should be kept as clear of wool as possible, in order to prevent lambs getting it into their stomachs.

Diarrhœa.

Symptoms.—Simple looseness of the bowels without much pain.

Cause. — Fresh, succulent herbage, especially when it has been touched with frost.

Treatment.—Change the pasture or source of irritation, and if weakness comes on, give rhubarb, 1 dr., and afterwards, in warm gruel, powdered opium, 20 grs.; catechu, ½ dr.; prepared chalk, ¼ oz.

Dysentery.

Symptoms.—Frequent evacuations of hard lumps of fœtid dung, mixed with slime and blood; loss of appetite; pain, fever, and great weakness. Affects sheep of any age, generally in the summer.

Cause.—Aggravated and unchecked diarrhœa; chills after being clipped. Many believe it to be contagious.

Prevention.—Sheep that are scouring should be watched, the food altered, and any aggravation of the attack checked.

Treatment. — Give in warm water, three times a-day, ipecacuanha, ½ dr.; powdered opium, 20 grs.; chlorodyne, 10 drops; chalk, ¼ oz. Gruel, or if animal will eat, flour-porridge, sprinkled with salt, should be given.

Hoove.

A distention of the stomach by gas, owing to the fermentation of food which has been too long retained in it.

Symptoms. — Enlargement of the belly, especially on the left side, which sounds hollow when tapped. Stupor and death follow, unless the animal is relieved.

Cause.—When sheep are incautiously fed on green clover or turnips, they are apt to eat to excess, and fermentation of food in the stomach sets in before the organs are able to dispose of the accumulation of food.

Prevention.—Green clover and turnips should be given in small quantities at first, and sheep should only be turned into a very succulent pasture for an hour or two till they get accustomed to it, when there will be no danger of hoove.

Treatment.—The insertion of a trocar into the flank will relieve the pressure of gas, and a dose of purgative (No. 33) will open the bowels. A drachm of chloride of lime dissolved in a quarter of a pint of water, and horned into the sheep, will often reduce the pressure of gas. The subsequent food should be rather scanty.

Inflammation of the Liver.

Symptoms.—Loss of appetite; skin hard and itchy; tongue foul; dung white and fœtid; weakness.

Cause.—Sudden change from poor to nutritious food is generally the cause.

Prevention.—Extra care when any change of food takes place.

Treatment.—Give daily, in gruel, purgative (No. 32). Foment the body near the liver with hot water, and inject warm water if the bowels are costive. In chronic cases of this disease, salt (4 oz. per head per week) should be given in addition to the purgative above mentioned.

Inflammation of the Stomach.

Symptoms. — Loss of appetite and separation from the flock; alternate hot and cold shivering fits; restlessness; straining to empty the bladder.

Cause.—Too nutritious food, or, in some cases, inflammation after castration.

Prevention. — Avoid exposing the lambs to chills and cold east winds after being cut, and exercise care when forcing on sheep for the market.

Treatment.—Foment the belly; give Fleming's tincture of aconite, 5 drops, twice a-day, and purgative (No. 34), halving the dose in the case of young lambs. Keep warm, and let the food consist of warm gruel with a little boiled linseed in it.

Jaundice.

Symptoms.—Yellowness of the skin and eye; constipation; urine brown; loss of appetite.

Cause.—Richness of the pasture, especially in damp sultry weather.

Prevention.—The use of salt among the artificial food, combined with care as to the nature of the pasture, will make the appearance of this disease rare.

Treatment.—Give purgative (No. 32) and frequent doses of salt, 4 oz. per head per week.

Rot.

Symptoms.—At first the animal will lay on fat very quickly, but afterwards the wool begins to fall off; the eyes become hollow, the belly enlarged; swell-

ings appear on the body; scouring sets in, and finally death ensues.

Cause.—The presence of the *Distoma hepaticum*, or flukes in the liver, especially prevalent in wet seasons, or when turnips are mildewed. Sheep fed on low-lying, wet, and undrained land are very subject to this disease.

Prevention.—The use of salt in the food and judicious grazing during wet seasons will do much as preventives.

Treatment. — Remove the flock at once to dry uplands or salt-marshes if available, and give salt in the food, 4 oz. per head per week, and as much in the troughs as the sheep will lick up.

II.—PARTURITION AND MILKING ORGANS.

Garget, or Inflammation of the Udder.

Symptoms.—Pain when the lambs are sucking, lameness, restlessness, fever, inflammation, and swelling of the udder, which becomes ulcerated and painful.

Cause.—Stoppage of the secretion of milk; exposure to cold; injuries.

Prevention. — Care should be taken to prevent the udder being surcharged with milk, especially when the lambs are weaned or dead.

Treatment.—Foment the udder with warm water, and clear it from all wool. If not very painful, let the lamb suck it and knock it about as much as possible. Give purgative (No. 33), and remove all the milk by frequent milkings; rub the udder with belladonna liniment.

Parturition Fever—"Heaving," "Straining."

Symptoms.—Fever, loss of milk, listlessness, frothy saliva, stiffness of the hind quarters, discharge of dark fluid from the vagina, swelling of the vagina, straining, and pain. The whole constitution will now be affected, diarrhœa will set in, followed by death. This disease is nearly always fatal.

Cause.—Probably the result of blood-poisoning, owing to deleterious matter entering the system through wounds of the parturient organs.

Prevention.—Should any wounds be made during parturition, they should be washed with warm water and syringed with lotion (No. 30) daily for some days, and afterwards anointed with glycerine, 8 parts, carbolic acid, 1 part. Great cleanliness should be observed in the lambing-yard, and a free use made of carbolic acid, and the hands washed and nails cut before manipulating the womb.

Treatment.—Besides the injection of carbolic lotion, give every four hours carbolic acid, 20 drops, in water; and if constipated, purgative (No. 33); give plenty of gruel and linseed-tea. If straining and diarrhœa come on, give whisky, 4 oz., and tincture of opium, 1 oz., in gruel. The treatment is, however, generally unsatisfactory.

Abortion,

or the premature expulsion of the fœtus.

Symptoms.—There are no particular symptoms in abortion among ewes.

Cause.—Overdriving; cold; improper food; injuries to or disease of the abdomen. A very frequent cause is the disturbance of sheep by dogs.

Prevention and Treatment.—When cases of abortion occur, the cause of the disease must, if possible, be ascertained and removed. It may generally be traced to one of the causes mentioned above. When one sees a flock of ewes occupying a turnip-fold, only vacated by the fat hoggs when it was too bad for them, up to their bellies in mud, one can hardly be surprised that cases of abortion are only too frequent. Given a proper rational system for the management of a breeding flock, and cases of abortion will be rare, and only the result of circumstances which cannot be altogether avoided. Should a ewe appear sickly after abortion, inject lotion composed of carbolic acid, 1 part; water, 40 parts; and give purgative (No. 33).

Tumours on the Udder.

Treatment.—Give purgative (No. 33), and lance the tumours, taking care that the bottom is reached; afterward dress with lotion (No. 30).

DISEASES AFFECTING THE LIMBS, FEET, AND SKIN.

Foot-rot.

Symptoms. — Lameness, which may be traced to disease between the claws of the feet, indicated by the discharge

of matter and swelling, which, if not checked, will gradually extend to the whole of the foot.

Cause.—Often contagion, grazing on low, rich pastures, encouraging overgrowth of the hoofs, which are apt to split and crack and collect dirt.

Prevention.—The maxim, "A stitch in time," &c., if put into practice, will prevent the disease spreading, and will soon cure those affected. As a means of prevention it is useful to pass the whole flock twice a-year through a solution of arsenic, put into a trough, through which the sheep are driven slowly. The solution is thus prepared: Boil 2 lb. of arsenic with 2 lb. of potash (pearl-ash) in 1 gallon of water over a slow fire for half an hour; keep stirring, and when like to boil over, pour in a little cold water; then add 5 gallons of cold water. Put this solution into the trough to the depth of 1¼ inch. The solution is poisonous, so the trough should be kept locked when not in use.

Treatment. — Pare away all loose ragged horn, to allow the matter to discharge, cut away any proud flesh with sharp scissors, dress the foot with chloride of antimony. If much diseased, wrap it in tow to prevent its getting fly-blown, and every day dress it with lotion (No. 31). Cauterising with carbolic acid might be tried, but it must be done very carefully.

Note.—Sheep, when they have travelled far on hard stony roads, get very foot-sore. When thus affected, the sore feet should be dressed daily with vaseline, and poulticed if required; any abscesses should be opened with a knife, and bathed with carbolic acid, 1 part, water, 30 parts.

Rickets—Weak Backs.

Lameness of hind quarters, resulting from fracture of bones, which, from their malformation, are liable to injury under trifling exertion. This disease only affects the lambs, and when once it appears, will run right through the flock. The outbreak may occur at any time of the year.

Symptoms.—Difficulty in rising; the fore feet are not affected.

Cause.—Peculiar condition of the soil, pointing to an insufficiency of particular elements necessary to produce a perfect offspring. Food grown on light moor tillage land, dressed with caustic lime, will produce rickets.

Prevention.—Avoid in-and-in breeding, and also food grown on land which, as above described, is apt to produce the malformity.

Treatment.—Direct treatment is useless.

Scab.

A pustular eruption of the skin, produced by parasites — the *Dematodectes ovis*—minute acari which burrow in the skin.

Symptoms. — Constant rubbing against gates, &c.; loss of wool; skin red, rough, and afterwards covered with hard scabs; loss of health and condition.

Cause.—Generally contagion.

Prevention.—Bottling, or smearing the sheep with salve, is the best preservative, and isolation of infected stock.

Treatment.—Rub the part affected with ointment composed of corrosive sublimate, 4 oz.; train-oil, 3 gals.; resin, 1 lb.; tallow, 1 lb.; and wash all posts and gates against which the sheep may have rubbed with carbolic acid, 1 part, water, 100 parts.

This disease comes under the Contagious Diseases Act.

Vermin.

Sheep ticks and lice may be destroyed by the use of one of the many dips which are sold for the purpose.

Maggots may be destroyed by applying spirit of tar, 1 part, olive-oil, 4 parts, to the places affected. It will also keep off the flies.

SWINE.

Anthrax—Blood-striking (see p. 472).

A disease of the blood.

Symptoms. — Dulness; thirst, hot ears, brownish-red eyes, tender hind quarters; urine, and sometimes the dung, mixed with blood, black spots on the skin, external swellings. When caused by eating the flesh or blood of animals dying of the disease, there is nearly always great swelling about the throat.

Cause.—Generally contagion.

Prevention.—Keep in good condition, and avoid close buildings, putrid food, and bad water. Completely isolate all diseased animals.

Treatment.—Owing to the rapid and fatal nature of this disease, all treatment is unsatisfactory. But it is not so fatal as in horses and cattle, although young pigs are more easily affected by it than grown ones. Give Epsom salts, 3 oz., and oil of turpentine, 2 drs., in a little linseed-gruel, and rub the limbs with oil of turpentine. Call in a veterinary surgeon, who will inject diluted carbolic acid under the skin.

Convulsions.

Symptoms.—Young pigs are subject to convulsions, which take the form of sudden spasms with complete insensibility, frothing from the mouth, and redness of the eyeballs.

Cause.—Disorders of the brain; indigestion; sometimes intestinal worms.

Prevention.—Good water and nourishing food.

Treatment. — Give a purgative — Epsom salts — regulating the dose according to size. Remove as far as possible the cause of the attack—*i.e.*, expel the worms if they exist (see p. 493), or alter the food if it has produced indigestion. Give sulphate of iron, 1 dr., in the food.

Diarrhœa.

Symptoms.—Looseness of the bowels, which affects the health. If unaccompanied by loss of appetite, fever, or prostration, no treatment is required beyond care that the complaint does not increase.

Cause.—Often a symptom of some other disease. Often caused by indigestion, putrid food or water.

Prevention.—Proper food and attention.

Treatment. — Give castor-oil, 3 oz., and peppermint-oil, 5 drops, in gruel, and if possible remove the cause of the complaint.

Erysipelas.

Symptoms. — Heat; itching; redness; tenderness and swelling of the skin, generally on the head and neck; loss of appetite. When the swelling goes down at the end of a few days, a dark-red patch will be left.

Cause.—Want of ventilation; dirt; heating food; wounds.

Treatment.—Give, in gruel, jalap, 1 dr.; sulphate of magnesia, 3 oz., mixed in a little water, and as soon as the purgative has acted, give muriate of iron, 10 drops, night and morning in food. Foment the swellings on the skin with water, 1 quart, in which 1 oz. of sulphate of zinc has been previously dissolved. Good nourishing food should be given, and the animal should be completely isolated.

Foot-and-mouth Disease.

A disease of the blood (see p. 474).

Symptoms.—Shivering; hot and dry mouth; lameness; blisters in the mouth, on the teats, and between the claws. Sometimes the entire hoof drops off. Animal buries itself in its bedding.

Cause. — Contagion, especially by means of milk, which should be boiled if suspected.

Prevention.—Total isolation of diseased stock and the use of disinfectants.

Treatment.—Give Epsom salts, 2 oz. Wash the mouth with lotion composed of borax, 1 oz.; tincture of myrrh, 1 oz.; and water 12 oz. Dress the feet and teats with carbolic acid, ½ dr.; glycerine, 10 oz. Feed on mashes, and remove all diseased horn in the feet, and poultice if much inflamed. Very dangerous to sucking-pigs.

The disease comes under the Contagious Diseases Act.

Husk (see p. 474).

Symptoms.—Short, dry cough; frothy discharge from the nose; loss of appetite; thirst; loss of flesh, till finally death results.

Cause. — The presence of worms in the air-passages, amounting almost to an epidemic in certain districts.

Prevention.—Keep in good condition, and isolate from infected animals.

Treatment.—Give, in milk, salt, 1 teaspoonful (1 dr.); oil of turpentine, 1 teaspoonful, daily. Fumigate in a close building by burning flowers of sulphur on a hot shovel till the animals can bear no more without coughing violently, and repeat the fumigation every week. Give

linseed-porridge, nourishing food and plenty of skim-milk.

Inflammation of the Lungs.

Symptoms. — Shivering; hot skin; laboured breathing; red eyes, nose, and mouth; cough deep and dry; yellow discharge from the nose.

Cause.—Cold, aggravated by neglect and predisposition to the disease.

Prevention.—Nourishing food, and warm dry bedding.

Treatment.—Cover with a warm rug, but allow plenty of cool fresh air; rub the chest with mustard, 1 part, and turpentine, 4 parts, and repeat the rubbing. Give spirits of nitrous ether, 2 drs.; tincture of opium, 2 drs., in a little milk twice a-day, and put 2 drs. of nitrate of potash in its food every time the animal is fed.

Measles.

Symptoms.—Fever; cough; loss of appetite; red patches on the skin; pustules under the tongue.

Treatment.—Give, fasting, 1 oz. of sulphur in the food, and repeat the dose till the animal is quite recovered. Keep the animals warm.

Protrusion of the Rectum.

After parturition the rectum sometimes protrudes and swells.

Treatment. — The gut should be emptied and washed. It may be returned by inserting the finger into the opening and pressing it into the anus. A nourishing diet should be given. Sometimes a truss will be necessary to keep the gut in its place after it has been returned. It may be necessary to amputate the protruding part. Advice should be obtained if this is found to be necessary.

Rheumatism, Cramp, Lameness.

Symptoms.—Dulness; lameness, especially of the hind quarters; tenderness of the joints; constipation.

Cause. — Damp bedding; lying on cold brick floors; chills. Especially prevalent where pigs lie on fermenting horse-manure.

Prevention. — Allow young pigs plenty of exercise and dry bedding in which they may bury themselves.

Treatment.—Give Epsom salts, 1 oz., and sulphur, 1 oz., in thin gruel, and repeat the dose twice a-week. Keep warm, and feed on nutritious food of good quality. Rub the limbs with turpentine, 4 parts; mustard, 1 part; and olive-oil, 2 parts.

Sore Throat (Malignant).

Symptoms.—Swelling of the throat and neck; bluish-black colour of the lining membrane of the mouth and throat; swelling of the tongue; loss of appetite; difficulty in breathing and swallowing; weakness and death.

Cause.—Exposure to cold and wet; improper food; dirt and neglect.

Prevention. — Cleanliness and complete isolation of diseased animals, and disinfection of premises tenanted by them.

Treatment.—A dose of Epsom salts, to be followed by small doses of chlorate of potash and acetate of ammonia in their food, with very hot fomentations to the throat.

Surfeit.

Symptoms. — Fever; swellings in patches on the lips, eyelids, and nostrils, which quickly appear and disappear.

Cause.—Change of food or climate. Generally occurs in the autumn.

Treatment.—Give in gruel, jalap, 1 dr.; Epsom salts, 1 oz., and avoid improper feeding.

Swine-fever—Hog-cholera.

Symptoms. — Shivering; dulness; sunken eyes; loss of appetite; thirst; unwillingness to rise; heat and soreness of the skin, which is covered with red and black patches; costiveness, followed by fœtid diarrhœa mixed with blood.

Cause.—Contagion.

Prevention. — Cleanliness and good food, together with ordinary care. Isolation from all infected animals, and the use of disinfectants, such as carbolic acid.

Treatment.—Immediate slaughter is the only course to follow at present. Immediately bury the dead body, and cover it with quicklime; disinfect the premises. This disease comes under the Contagious Diseases Act.

Worms (Intestinal).

Symptoms.—Ill-health; scurvy; dry skin; irregular appetite; itchiness of the arms, and the passing of worms; loss of flesh; cough; scour.

Prevention.—Sound food and water.

Treatment.—Give santonine, 3 grs., on an empty stomach, and four days later repeat the dose; the next day give 3 oz. Epsom salts. Allow access to plenty of coal, slack, or cinders, so that the pigs may eat as much grit as they like.

Trichinosis.

A parasitic disease of the pig, but rarely seen in this country.

Symptoms.—The animal is dull, loss of appetite, goes stiffly, vomits frequently. As the disease advances, the animal persistently stands, and when it lies down it tries to bury itself under the bedding.

Cause.—It is due to a minute worm called the *Trichina spiralis*, which infests the whole body, causing what is called measly pork; far more common in Germany and America than in this country.

Treatment.—Slaughter and bury the animals at once, for the diseased pork is poisonous to human beings.

Lice.

These may be easily removed by washing with water saturated with petroleum.

RECIPES.

The scientific names are given as found in the *British Pharmacopœia* and *Squire's Companion to the British Pharmacopœia*. Directions for preparing the mixtures are appended to each recipe.

ABBREVIATIONS.

Grains, grs.; scruple, scr.; drachms, drs.; Pounds, lb.; ounces, oz.; quart, qt.; pint, pt.

HORSES.

BLISTERS.

1. Powdered cantharides (*P. Cantharis*), 1 oz.
   Olive-oil (*Oleum olivæ*), 8 oz.

Use the ordinary "salad-oil" obtainable from grocers. Mix together in an earthenware pot, and infuse in a water-bath for four hours, and strain. Clip hair off the part before application.

2. Powdered cantharides (*Cantharis*), ¼ lb.
   Lard (*Adeps præparatus*), 1 lb.
   Resin (*Resina*), ¼ lb.

Melt the resin and lard together at a low temperature, then sprinkle in the cantharides, and stir till cold.

3. Perchloride mercury (corrosive sublimate) (*Hydrargyri perchloridum*), 40 grs.
   Methylated spirit (*Spent methyll*), 1 oz.

To be applied with a small brush. Shake together in a bottle until dissolved.

4. Red iodide of mercury (*Hydrargyri iodidum rubrum*), ½ lb.
   Lard (*Adeps præparatus*), 4 lb.

Mix together. Poison.

5. Iodine (*Iodum*), 2 oz.
   Iodide of potassium (*Potassii iodidum*), 1 oz.
   Camphor (*Camphora*), ½ oz.
   Methylated spirit, 1 pt.

Should be made up by a qualified party. Put the iodine and iodide of potassium in a bottle with 15 oz. of the spirit, shake till dissolved. Dissolve the camphor in 5 oz., then mix together.

CONDITION POWDERS.

6. Fenugrek, 2 parts.
   Carbonate of iron, 1 part.
   Nitrate of potassium (*Potassii nitras*), 2 parts.
   Gentian powder (*Gentianæ radix*) 1 part.
   Sulphur (*Sulphur sublimatum*), 2 parts.

Mix all together and sift. Give 1 oz. daily in the food.

COOLING LOTION.

7. Solution of subacetate of lead (*Liquor plumbi subacetatii*), 1 part.
   Tincture of arnica (*Tincturæ arnicæ*), 3 parts.
   Water (*Aqua*), 8 parts.

Mix.

COUGH BALL.

8. Digitalis (*Digitales folia*), ½ dr.
   Powdered opium (*Opium*), 1 dr.
   Aloes (*Aloe barbadensis*), 1 dr.
   Soft-soap (*Sapo mollis*) } enough to
   Linseed-meal (*Lini farina*) } make a ball.

Make into a stiff mass. Give one ball every day.

DRAUGHTS.

9. Spirits of ammonia (*Spiritus ammoniæ aromaticus*), 1½ oz.
   Chloroform (*Chloroformum methyll*), 1 oz.
   Bicarbonate of potash (*Potassii bicarbonas*), ½ oz.
   Water (*Aqua*), 10 oz.

Mix. Shake up well before giving in gruel or other bland liquid. Every two hours till improvement, then twice a-day.

FOR BRONCHITIS.

10. Tincture of digitales (*Tinctura digitalis*), 3 drs.
    Bromide of potassium (*Potassii bromidum*), 2 drs.

Nitrous ether SPIRIT (*Ætheris nitrosi*), 1 oz.
Water (*Aqua*), 10 oz.
Dissolve bromide of potassium in water, add the other ingredients, and make up with water to 10 oz. To be given three times a-day.

FOR WORMS.

11. Extract male fern (*Extractum filicis liquidum*), 2 drs.
Oil of turpentine (*Oleum terebinthinæ*), 1½ oz.
Linseed-oil (*Oleum lini*), 1 pt.
Mix and shake well together.

EMBROCATION.

12. Hartshorn (*Liq. ammon. dil.*), 1 oz.
Turpentine (*Oleum terebinthinæ*), 2 oz.
Spirit of camphor (*Spiritus camphoræ*), 2 oz.
Laudanum (*Tinetura opii*), ½ oz.
Olive-oil (*Oleum olivæ*), 6 oz.
Mix the hartshorn with the olive-oil, and shake, then the turpentine, spirit of camphor, and laudanum, shaking after each addition. Shake well before using.

GLYSTER.

13. Oatmeal, 3 qts.
Salt, 3 oz.
Olive-oil, ½ pt.
Give warm, and repeat till relief is given.

IRRITANT.

14. Ammonia solution (*Liquor ammoniæ*, F.), 3 oz.
Soft-soap (*Sapo mollis*), 4 oz.
Oil of turpentine (*Oleum terebinthinæ*), 8 oz.
Olive-oil (*Oleum olivæ*), 4 oz.
Rub the soap with the olive-oil to smoothness, then add turpentine and ammonia solution. Bottle, and shake well.

LINIMENT.

15. Mustard (*Sinapis*), 4 oz.
Oil of turpentine (*Oleum terebinthinæ*), 5 oz.
Linseed-oil (*Oleum lini*), 1 pt.
Mix together, and shake thoroughly.

LOTION.

16. Tincture of myrrh (*Tinctura myrrhæ*), 1 oz.
Alum (*Alumeu*), 2 drs.
Water (*Aqua*), 6 oz.
Mix together.

PURGATIVES.

17. Aloes powdered (*Aloe barbadensis*), 6 drs.
Ginger (*Zingiber*), 2 drs.
Made into a ball with soap or treacle.

18. Calomel (*Hydrargyri subehloridum*), 1 dr.
Opium, powdered (*Opium*), 20 grs.
To be made into a ball with linseed-meal and treacle.

19. Aloes (*Aloe barbadensis*), 1½ dr.
Tartar emetic (*Antimonium tartaratum*), 1 dr.
Nitre (*Potassii nitras*), 2 drs.
Digitalis (*Digitales folia*), ½ dr.
To be made into a ball with meal and treacle.

ORDINARY PURGATIVE.

20. Barbadoes aloes (*Aloe barbadensis*), 1½ dr.
Calomel (*Hydrargyri subehloridum*), 1 dr.
To be made into a ball with meal and treacle.

TONIC.

21. Sulphate of iron (*Ferri sulph.*), 1½ dr.
Sulphate of quinine (*Quininæ sulph.*), 20 grs.
Sulphuric acid, diluted (*Acidum sulphuricum dilutum*), 2 drs.
Water (*Aqua*), 10 oz.
Dissolve the sulphate of iron in water, diffuse quinine in the solution, then add diluted sulphuric acid, and make up to 10 oz.
Give morning and night.

CATTLE.

BLISTER.

22. Powdered cantharides (*Cantharis*), 1 oz.
Olive-oil (*Oleum olivæ*), 8 oz.
Use the ordinary "salad-oil" obtainable from grocers. Mix together in an earthenware pot, and infuse in a water-bath for four hours, and strain. Clip hair off the part before application.

23. Powdered cantharides, 1 part.
Venice turpentine, 1 part.
Resin, 1 part.
Lard, 4 parts.
Melt resin and lard together, then stir in the cantharides and Venice turpentine.

CALF-CORDIAL.

24. Prepared chalk (*Creta præparata*), 2 oz.
Powdered catechu (*Catechu*), 1 oz.
Ginger (*Zingiber*), ½ oz.
Opium (*Opium*), 2 drs.
Peppermint-water (*Aquæ menthæ peperitæ*), 1 pt.
Dose for calf, two tablespoonfuls morning and evening; dose for sheep, one tablespoonful morning and evening.
Mix all together.

DRAUGHT FOR COUGHS, &c.

25. Powdered digitales (*Digitales foliæ*), 1 dr.
Liquor ammonia acetatis (*Liquor ammonii acetatis*), 3 oz.
Spirit nitrous ether (*Spiritus ætheris nitrosi*), 2 oz.
Extract belladonna (*Extractum belladonnæ*), 2 drs.
To be given in a pint of water.
Melt extract of belladonna in a little warm water; when cold, add the other ingredients.

Shake, and make up to a pint with cold water.

LINIMENT.

26. Oil of turpentine (*Oleum terebinthinæ*), 8 oz.
Solution of ammonia (*Liquor ammoniæ*, F.), 3 oz.
Soft-soap (*Sapo mollis*), 4 oz.
Rub down the soft-soap in the turpentine, then add the ammonia, and shake.

PURGATIVES.

27. Epsom salts (*Magnesii sulphas*), 16 oz.
Powdered aloes (*Aloe barbadensis*), 8 drs.
Ginger (ground) (*Zingiber*), 1 oz.
To be given in a quart of warm water or gruel.
Epsom salts for cattle costs 1s. a stone. Use Barbadoes aloes and ordinary domestic ginger.

MILD PURGATIVE.

28. Epsom salts (*Magnesii sulphas*), 12 oz.
Powdered ginger (*Zingiber*), ½ oz.
To be given in a quart of warm water or gruel.
Salts for cattle, and ordinary ginger.

TONIC.

29. Gentian (*Gentianæ radix*), 1 oz.
Ginger (*Zingiber*), ½ oz.
Carbonate of ammonia (*Ammonii carbonas*), ½ oz.
Carbonate of iron, 2 drs.
To be given in a pint of gruel or water.

SHEEP.

LOTION.

30. Carbolic acid (*Acidum carbolicum*), 1 part.
Water (*Aqua*), 50 parts.
Shake.

DRESSING FOR FOOT-ROT.

31. Red nitrate of mercury (*Hydrargyri oxidum rubrum*), 1 oz.
Nitrous acid, 2 oz.
To be mixed with two tablespoonfuls of water; dissolve the red nitrate of mercury in the acid, and then add the water.

PURGATIVES.

32. Calomel (*Hydrargyri subchloridum*), 5 grs.
Powdered opium (*Opium*), 4 grs.
Epsom salts (*Magnesii sulphas*), 1 oz.
To be given in 3 oz. of gruel or water.
All obtainable from a druggist. Mix and give in gruel. Ask for Epsom salts for cattle.

33. Epsom salts (*Magnesii sulphas*), 3 oz.
Ginger (ground) (*Zingiber*), 1 dr.
In thin gruel.
Take ginger used for domestic purposes, mix with the salts, and give in thin gruel.

34. Castor-oil (*Oleum ricini*), 2 oz.
Tincture of opium (laudanum) (*Tinctura opii*), 2 drs.
Use ordinary castor-oil and laudanum; mix, and give.

Note.—The doses given, except where otherwise stated, are intended for fair-grown animals of medium size. Allowance must therefore be made should the age or size of the animal to be treated exceed or otherwise the average.

TABLE OF DOSES.

Horse.	Cattle.	Sheep.	Swine.	Doses.
4 years and over .	2 years .	1 year .	1 year .	1 part.
2 to 3 years . .	1 " .	6 months	6 months	⅔ "
1 year . . .	6 months	3 " .	3 " .	¼ to ⅓ part.
2 to 10 months .	1 " .	1 " .	1 " .	$\frac{1}{10}$ to $\frac{1}{10}$ part.

APPENDIX.

ADMINISTERING MEDICINE.

Some notes will be useful as to the methods of administering medicine to the various animals.

The Horse.

Medicine is usually given by the mouth, but sometimes injected under the skin into the blood, the rectum, and by inhalation.

A drench should never exceed a quart, and before giving it, make sure that it is neither too hot nor too strong, for choking will follow.

A tin bottle is the best for drenching with; if this cannot be had, use a champagne-bottle.

How to fix the animal.—Put on a head-stall or halter; take a piece of rope or plough-line, make a loop at one end, pass the loop first through the nose-band of the halter or head-stall as the case may be, then into the mouth, throw the other end over one of the rafters above,

and pull the horse's head up; the medicine should be slowly poured into his mouth, for horses are slow swallowers. Never be guilty of pouring it down the horse's nose, as I have seen some men do, and kill the animal. If the animal makes an attempt to cough whilst you are drenching him, let his head down instantly.

The Ball.—They should never exceed 1½ oz. in weight, and never be given when they have become hard. The best way to give a ball is by the hand, and with a little practice it can be soon learned. Take the tongue gently in the left hand, and draw it to the side of the mouth, place the ball between the fingers of the right hand, quickly run the hand along the roof of the mouth, and leave the ball at the back of the tongue; withdraw the hand, and let go the tongue. The animal will soon swallow, and you will see the ball pass down the left side of the neck. If you are not clever enough to give it in the manner described, use a balling gun or iron. Do not attempt to give a ball on the end of a pointed stick, for you are sure to run the stick into some vital part of the throat, and perhaps ruin the animal.

Cattle.

The cow is best drenched with a bottle or horn, and the quantity should not exceed 2 qts. In giving the medicine, stand on the right side of the cow, seize the nose with the thumb and finger of the left hand, and get some one to hold the horns on the left side. A cow swallows much more quickly than the horse, so it takes but a minute or two to give a drench.

Sheep.

A long-necked sauce-bottle is best to use for sheep. The quantity to be given should not exceed 4 oz. Stand on the right side, span the nose with your finger and thumb, place the finger in the mouth, and slowly run the medicine in at the right side of the mouth.

Swine.

The quantity to be given should not exceed 5 oz. In giving physic to a pig, take a child's old boot, cut a hole in the toe of it about the size of a shilling, place the toe of the boot into the pig's mouth, pour the medicine into the leg portion of the boot, and the pig will bite savagely at the boot and swallow the medicine at the same time.

FOMENTATION.

Fomentation is of great value in all cases of pain and inflammation. Never start to foment a part, however, without having plenty of hot water and time, for it does little or no good unless continued for an hour or two.

In cases of external injuries or inflammation—if it is on the knee or below it—place the leg in a tub full of hot water, if elsewhere soak a piece of flannel or sponge in hot water, and hold on the part.

For internal inflammation, such as in the bowels and the chest, double a blanket, soak it in hot water, and have it held against the chest or belly as the case may be, by a man on each side of the animal, and place over it a waterproof carriage-rug to keep in the heat. The blanket must be dipped into the hot water every three or four minutes. If the blanket is too hot for your hand it is too hot for the horse's skin, so be careful not to scald the animal.

ENEMAS.

Enemas or injections are of various kinds, and are given in cases of constipation to hasten the action of the bowels; in dysentery and diarrhœa, to check the action of the bowels; in debility, to support the animal, and when in pain to relieve it.

An enema for constipation should consist of linseed-oil, 1 pint; salt, 4 oz; and warm water, 1 gallon, to be repeated, if required, every four hours.

For diarrhœa and dysentery use liquor *opium sedativus*, 2 oz.; starch, 4 oz.; and warm water, 3 pints. For weakness and debility use half a gallon of warm milk with two eggs, or the same quantity of beef-tea to be given every four or six hours.

To relieve pain use warm water, 1 quart; extract of belladonna, 1 drachm; or liquor *opium sedativus*, 1 oz.; to be given every three hours.

An enema is given by the enema-syringe, and the tail should be depressed for a few minutes after it is given.

BACK-RACKING.

This is occasionally done to remove the hard dung from the bowels, but it is not necessary if an enema has been given. The person who performs this operation should have a small hand, cut the nails short, and oil the hand before introducing it.

POULTICES.

Poultices are applied to certain parts to relieve pain, soften, and draw out any matter that may exist. The poultice should be made of boiled turnips or bran, the softer and warmer the better. A poultice to do any good must be of considerable size, kept on from twelve to twenty-four hours, with hot water continually poured over it, taking care not to scald the animal.

For the foot the poultice should be placed in a stout bag, and fixed around the fetlock by a strap.

CASTRATION.

The horse is usually operated upon at the age of one or two years; but he is sometimes allowed to go uncut until three years old to see if he is worth keeping for an entire horse, or to allow his neck to get developed. The spring or autumn is the best time to perform this operation, as we then avoid the cold winds of winter, and the sultry weather and the troublesome flies of summer.

There are various ways of performing this operation, but the best and most successful way is either by torsion or the hot iron. Some precautions should be taken before operating. Handle the colt for several weeks before, so that when he comes to be cast he will not fight, struggle, and break out into a sweat; feed him sparingly the day before the operation; make sure that both testicles are down and no rupture exists; always see that the ground is soft and free from stones where you intend to cast the animal.

Having haltered the colt, take him to the chosen spot, pass his head through the loop in the rope, pass the two ends between his fore and hind legs, bringing them back, pass them through the loop at the shoulders, and draw tight until the animal is on his side; then tighten up, wind the rope around the fetlock, include the fore legs, and get a man on each side to hold the end of the rope so as to keep the animal on his back.

To remove the stones by torsion, make a bold cut through the bag, release the stone, place the clams around the cord, put the torsion forceps on the cord about half an inch from the clams, and twist the forceps slowly around until you sever the cord; the other stone to be treated in the same way.

To operate with the hot iron: Having placed the stone in the clams, take a red-hot iron and saw the cord slowly through close to the clams.

As to after-treatment, house the animal for a few days, and then let it run out during the day, housing it again at night.

From castration, lockjaw, bleeding, inflammation of the bowels, or broken back sometimes arise.

If the animal has only one stone down, postpone the operation, for it is almost certain to come down in a few months; if it never appears, the animal is most likely a "rig," and must be operated on as such.

Calves.

When a few weeks old they can be cut standing, by twisting the tail around one hind leg. Stand behind the calf, cut through the bag, twist the stone several times and scrape the cord closely through with your finger-nails or a blunt knife. When they are several months old they require to be cast. This is done by tying the hind legs together with a rope, place a halter around the neck, take the shank end of the halter and run it through the rope that joins the hind legs, tying it back, pass it through the portion that is around the neck, and draw the legs tight, and fasten. The fore legs can be held by a man. Take the stones off with the hot iron as in the case of the horse.

The bull is best castrated standing with the hot iron.

Pigs.

Let a man seize the pig by its hind legs and hold it between his legs. Cut through the bag, twist the stone several times, and scrape through the cord with a blunt knife or your finger-nails.

Lambs.

Let some one hold them on a bench for you; cut the tip of the bag off, and use the hot iron and clams, or do them the same way as the pig. In many parts, one person takes the lamb in his arms, holding its four legs tightly, two in each hand, while the shepherd cuts the top off the bag with a sharp knife, presses out the stones with his fingers, and draws them away with his teeth, then using the hot iron.

SPAYING.

Heifers and sows are frequently spayed in order that they may fatten more quickly, but a description of this operation would not enable one to do it, and it can be learned only by watching those skilled in it.

DOCKING.

It is best performed when the animal is but a few months old, and at that age the tail can be easily cut off with a stout pocket-knife, and the end seared with the poker. In adults the operation is as simple, but often followed by excess of bleeding, lockjaw, or an abscess at the end of tail. Having parted the hair at the spot where the tail is to be cut off, tie the top hair back, get some one to hold the tail out, and with a sharp stroke of the docking-machine it is divided. Afterwards, hold the tail up, slightly sear it with the searing-iron, then place a piece of tow saturated in perchloride of iron on the end, bring the hair over it, and tightly tie below.

SETONING.

Setons are tapes passed through certain parts of the body, with the object of either draining an abscess, acting as a counter-irritant, or for the purpose of inoculation.

In using a seton for draining an abscess, such as poll-evil or fistulous withers, always bring it out at the lowest part of the abscess, so as to secure drainage.

In using setons as counter-irritants in cases of lameness, diseases of the eye or brain, pass them simply underneath the skin, and be careful not to wound any internal structure.

For inoculation, in cases of black-quarter or pleuro-pneumonia, the seton must be soaked with some irritant, such as embrocation (No. 12) in the case of black-leg, but in pleuro-pneumonia with the serum of a diseased lung.

NURSING THE SICK.

All the doctoring in the world is of no avail unless associated with good nursing.

Sick horses should be placed in a comfortable loose-box, free from draughts, and with plenty of straw in it. In cold weather a rug should be placed on the animal, and its legs bandaged. Animals, like human beings, soon lose their appetite when sick, so that every means should be tried to induce them to feed. The diet must be soft, nourishing, and given frequently in small quantities.

The following foods are recommended: bran-mashes, with bruised oats, sweet hay with a little treacle-water sprinkled over it, scalded oats, a little linseed-cake, and, when in season, grass, tares, carrots, and parsnips can be given sparingly if the horse is not suffering from any bowel affection. A pail of oaten or linseed gruel should be placed within the reach of the animal, and if it does not drink this, give it treacle-and-water, or water with a tablespoonful of nitre dissolved in it. Take the chill off the water if the weather is cold.

Never allow one kind of food to remain too long in front of the animal; take it out and try something fresh. The animal should, if strong enough, and the weather permits, be taken out every day, and led up and down for half an hour with a rug on. Exercise of this kind strengthens the animal and increases the appetite. See that the

manger and bucket from which the horse is fed are clean, for horses are naturally very sensitive as to what they eat, and more so when they are sick. Sick horses should every morning get a thorough wisping down.

Do not work the animal before it has properly recovered, and then gradually.

A USEFUL TABLE.

It is useful for stock-owners to have before them the following table, indicating a normal condition of the pulse, respiration, and temperature of their various animals; also the period of gestation.

	Pulse.		Respiration—Beats per Minute.	Temperature—Degrees Fahrenheit.	Average Duration of Pregnancy.
	Beats per Minute.	Where felt.			
Horse . .	40	Jaw . . .	10	100	11 months.
Cow .	45	Jaw . . .	12	101	285 days.
Sheep	75	At the heart	18	101	151 days.
Pig . .	60	At the heart	15	100	4 months.
Dog. . .	100	Thigh . .	20	102	9 weeks.

FARM-SERVANTS AND WAGES.

The labour of the farm is an important element in agricultural economy. Its cost has advanced from 30 to 50 per cent, in some parts even more, since the first edition of this work was issued. In all respects the condition of the farm-labourers in the British Isles has been greatly ameliorated since 1850. They not only receive higher wages, but they are also provided with more comfortable dwellings, are better treated in regard to food, and have shorter and more regular hours of labour.

Methods of Hiring.

The methods and times of hiring and terms of engagements vary greatly throughout the country. Generally speaking, half-yearly or yearly engagements prevail in Scotland, with wages paid in one sum at the end of the term, or in instalments as arranged. In England and Ireland the terms are shorter and less regular, wages being as a rule payable weekly and engagements similarly terminable.

Hiring markets, at which servants and farmers meet and make engagements, are held at many centres throughout the country; but there is a growing tendency to avoid these public fairs and have the engagements made by private inquiry or through registry offices.

For harvest-work extra hands are employed, most likely at fairs held in towns and villages.

Wages and Perquisites.

The rate of wages, as well as the form in which the payment is made, varies greatly throughout the United Kingdom. A few samples will best indicate the general custom.

South of England.—In Essex a horse-keeper or ploughman is paid as follows:—

52 weeks at 14s. per week . .	£36	8	0
Extra for haymaking, 4 weeks .	1	10	0
Do. in harvesting . . .	3	10	0
Cottage	5	0	0
Firewood, beer-money, &c., say .	1	2	0
Total value for the year . .	£47	10	0

This is the rate for the best men. Ordinary men get about 1s. per week less. In the neighbourhood of London the rate

of wages is higher by 2s. or 3s. per week. On the other hand, in counties further away from London, the rate is lower—10s., 11s., and 12s. per week, with similar perquisites, being paid in several English counties.

In Essex, a day's work with horses is only 7½ to 8 hours. Including cleaning and feeding, the men are daily about 9½ to 10 hours in actual work; general labourers, 9½ hours, sometimes 10 hours daily. Field-work all stops at 4 P.M., except in haymaking and harvesting.

Bailiffs get about £50 to £60 in money, with house and perquisites in addition. Cattle-men generally get 2s. or 3s. per week more than ploughmen, as their hours are a little longer, and they have Sunday work. Housemaids get about £7 to £8 per annum. No servants are boarded; every man brings his own food, and takes his meals in the stable, barn, or outside in summer. The men will likely have a fire in the harness-room in cold weather.

These rates with little variation would apply to a great part of England.

North of England.—As a rule, the rate of wages is higher in the northern than in the southern counties of England; and it is asserted by many that the quality of the labour is better. The following are the wages and perquisites on a farm in North Durham: *Steward*—21s. per week, free house and garden, coals driven to him, a cartload of potatoes as they are lifted, and a sack of flour at Christmas. *Cattle-men*—19s. per week, and the same perquisites as above. *Ploughmen*—18s. per week, and the same perquisites as above. *Women field-workers*—2s. 6d. per day in harvest, and 1s. 2d. per day at other times. *Kitchen servants*—£19 per annum and board. *Housemaid*—£12, 10s. and board. Lads, boarded in the farm kitchen, hired half-yearly, get from £20 to £27 a-year, according to ability.

In Northumberland wages are about 1s., and in South Durham 2s., per week less than the above.

In this part of the country the men are usually hired for the year, and the wages paid fortnightly "in sickness and in health, rain or shine." The sack of flour mentioned above as given at Christmas is anent food and extra hours in haytime and harvest, and is conditional upon the man giving satisfaction to his employer.

The feeding of farm-servants in this part of the country is very different from what it was about 1850. Tea and coffee are now largely substituted for oatmeal, and beef and mutton for bacon. The hinds have usually at least a two-roomed house, with a garden for vegetables. A man who has in his family a lad or a woman to work out in the fields can generally obtain about 1s. per week more wages than if he could not provide these workers. Although what is known as the "bondage" system has been nominally abolished, families with working members in it are most in demand.

As to the hours of labour, the rule in this district in the spring and summer months is for the ploughmen to take their horses out of the stable at 6 A.M.; they are allowed a quarter of an hour for breakfast, and a quarter of an hour for tea in the field, with two hours for dinner, the day's work terminating at 6 P.M. Female field-workers commence work at 8 A.M., have an hour and a half for dinner, and stop work for the day at 6 P.M.

In Northumberland and many other parts, the women and the men have the same hours at work.

Berwickshire.—Where paid by the "old boll," the allowances for ploughmen are, per annum: £12 in money; 60 bushels of oats; 30 bushels of barley; 1800 yards potato-ground; one cow housed and fed; free house and coal driven; butcher-meat for one month in harvest. When paid by money, the rate is: 13s. per week, with a cow's keep, 1800 yards of potato-ground; or 16s. per week, if no cow is kept. Women at farm-work get 9s. per week in the summer half-year, and 8s. per week in the winter, with 15s. per week in the few weeks of the grain harvest.

Farm grieves get about £10 more. Cattle-men get about the same as ploughmen. Shepherds have similar perquisites, but instead of money most of them are allowed to keep a "pack" of their own, consisting perhaps of about 10 ewes and 3 hoggs, it being a condition that they keep a strong lad, who receives about 9s. per week. The shepherds on the Cheviot Hills will have about 50 Cheviot ewes and

hoggs in their own "pack," with a cow's keep, three loads of oatmeal, and coal or "peat" driven. The general tendency now is to lessen the perquisites and increase the payment in money; but it is very doubtful if this change is advantageous to the servants.

East Lothian.—In East Lothian, *Farm managers* who have entire charge get from £70 to £100 a-year, a cow's keep, 1 ton dressed potatoes, and in some cases free coals and light. *Stewards* get £40 to £60, a cow's keep, 1 ton dressed potatoes, 40 to 65 stones oatmeal, harvest food or £1 for same; in some cases 2 tons of free coals and ½ quarter of wheat. *Working grieves* get £30 to £40, a cow's keep, 1 ton of dressed potatoes, 40 to 65 stones oatmeal, ½ quarter wheat, harvest food or £1 for same. *Ploughmen*, when a money wage is agreed upon, get 15s. to 16s. a-week, 16 cwt. to 1 ton of dressed potatoes, harvest food or £1 for same. A leading ploughman, who stacks and sows, gets ½ quarter wheat for same. When the payment is in money and meal, the ploughman gets £30, with 65 stones oatmeal, 16 cwt. to 1 ton dressed potatoes, harvest food or £1 for same. Ploughmen on the "gains" system get £24 to £26, 65 stones oatmeal, 16 cwt. to 1 ton dressed potatoes, 1½ quarter barley, ½ quarter beans (some get in place of barley and beans 2 quarters wheat), harvest food or £1 for same. On some farms in the upland parts of the county a cow is kept by the ploughman, and £5 to £6 deducted from the money wage. *Cattle-man.*—If a first-class man, he is paid the same wage as a ploughman, but has extra for Sunday labour, generally £1, but in some cases 1s. for each Sunday's labour. *Cottars* (out-workers) get 1s. 4d. a-day, 8 to 10 cwt. dressed potatoes, harvest wages and food for a month, or, in place of harvest wages and food, £2. Some also get extra pay during potato-lifting, to the extent of 6d. or 8d. per day. Frequently cottars do not take potatoes, and in such cases 1s. 6d. a-day is paid instead of 1s. 4d. *Boys and girls* get from 9d. to 2s. a-day, according to qualifications. These generally are the sons and daughters of the householders on the farm, and reside with their parents.

In adjoining counties the rates are similar, although the form in which the perquisites are given varies considerably.

West of Scotland.—In the west of Scotland the good old system of boarding the servants in the farmer's kitchen still survives, although it is not so general as in former times. On an Ayrshire farm, with half-yearly engagements, the rates are: ploughmen from £12 to £17 per half-year, with board and lodging; dairy-maids from £11 to £14 per half-year; general women servants, for wintering cattle, house and outdoor work, from £8 to £10; and lads from £5 to £10 —all with board and lodging.

Forfar and Perth.—The wages and perquisites generally paid in these counties are:—

Farm Grieves or Stewards (generally Married Men).

Experienced men of this class, at present, get on an average wages equal in value to about £65 a-year, or 25s. a-week, as under:—

1. Cash, from £40 to £45, say	£42	10	0
2. Oatmeal, an allowance of 6½ bolls (a boll of meal being 140 lb.) during the year, equal in value to about	5	10	0
3. Sweet milk, an allowance generally of 24 gills daily, yearly value	9	0	0
4. Potatoes, 1 ton of potatoes, average value	2	10	0
5. Free house and garden, equal to	6	0	0
	£65	10	0

Besides other small perquisites, such as firewood for kindling, not included.

Very often grieves get a whole cow's milk, which would be worth not less than £15 a-year; but when a cow is given, the allowance of money is generally less in proportion, so that the result would be much the same.

Ordinary Ploughmen.

This class of servants get on an average about £48, 10s. a-year, or 18s. 6d. a-week.

In the case of *married men*, as under:

1. Cash, from £28 to £32, say	£30	0	0
2. Oatmeal, 6½ bolls, value	5	10	0
3. Milk, 16 gills daily, value	6	0	0
4. Potatoes, 1 ton, average value	2	10	0
5. Free house and garden, value	4	10	0
	£48	10	0

In the case of *unmarried men* living in bothies, the details are somewhat different, namely :—

1. Cash, from £30 to £34, say	£32	0	0
2. Oatmeal, usual allowance of 6½ bolls, value	5	10	0
3. Milk, 16 gills daily, value	6	0	0
4. Fuel and light supplied free by the master, equal to	2	10	0
5. Lodgings, valued at 1s. a-week	2	12	0
	£48	12	0

Foremen in this class and experienced cattle-men generally get from £2 to £3 more.

Extra or "Orra" Labourers, engaged only from day to day.

This class of servants get: Men, from 3s. to 3s. 6d. a-day; women and young lads, from 1s. 4d. to 1s. 6d., without any other allowance. During harvest and potato-lifting, however, these orra workers get extra pay.

In harvest, men get from 30s. to 36s. a-week; women, from 25s. to 30s. a-week. During potato-lifting, men get from 18s. to 21s. a-week; women and boys, 12s. to 15s. a-week.

Women engaged for the year to work in the house and out on the farm when required, get from £16 to £20 a-year, with board. Servants for house-work only, about £2 less.

"Halflin" lads engaged for the year get from £14 to £17, with the same allowance of meal and milk as other men.

Morayshire.—The following are the rates for the year paid by several farmers in this county :—

Grieves, in money, £30 to £35, and the following perquisites :—

House, say	£3	0	0
Coals, 1 ton	1	0	0
Potatoes, say	2	0	0
Meal, 66 stones, at average of, say, 13s. 6d. per imperial boll—in all, say	4	10	0
	£10	10	0

Ploughmen (married), £22 to £27, and the same perquisites.

Ploughmen (single, in lodgings), £22 to £27, and the following perquisites :—

Lodgings, 1s. a-week	£2	12	0
4 bags potatoes, say	0	15	0
Meal, same as married men	4	10	0
	£7	17	0

Ploughmen (single, in bothy), £22 to £27, and the following perquisites :—

Potatoes, say	£1	0	0
Meal, same as married men	4	10	0
Coals for bothy fire, say	2	0	0
	£7	10	0

Lads (in lodgings), £12 to £19, and—

Meal	£4	10	0
Potatoes	0	15	0
Lodgings	2	12	0
	£7	17	0

Lads (in bothy), £12 to £19, and same perquisites as single ploughmen.

Lads (in kitchen), £12 to £19, and board in kitchen, say £10.

Out-women, £12 to £16, and board in kitchen, say £10.

Kitchen-women, £10 to £15, and board in kitchen, say £10.

Milk is paid for in all these cases. The men get it at the farms good and by large measure, but they pay for it. They may buy it, however, anywhere else, which they never do. This is to save complaints as to quality of it.

As to the housing of servants, ex-Provost Black of Sherifston, to whom we are indebted for the foregoing figures, says :—

"Morayshire is on the whole well provided with houses for married servants. I have all I need—seven in number.

"I have sometimes a single man or lad, or both. They are lodged with some of the ploughmen, or in a cottage on the farm, where they find lodgings when they prefer it. They get their food prepared, their house-room, and fire and light, for 1s. a-week. They sleep at the steading in an apartment for the purpose, adjoining the stable—indeed, over a loose-box. I mean to turn the loose-box itself into a sleeping-room after Whitsunday, fitting it up properly for the purpose.

"I have no bothy. They are used, however, on most of the large farms, and are generally of a superior and comfort-

able character, kept clean and tidy, and the men's food prepared either by one of the out-women or one of the kitchen-women.

"On the smaller farms a good many still have the men and lads in the kitchen. Young lads prefer this to the bothy—or, at any rate, their fathers and mothers do. Some of the men prefer the kitchen—others the bothy.

"Out-working women are very few in number now—I mean 'fee'd' ones. Most of them are hired by the day. I hire all at 1s. 3d. a-day. They find everything themselves. Sometimes at hoeing-time the wage is 1s. 6d.; and in harvest this year (1890) it was 17s. a-week—last year, 15s. 6d.—they finding everything except the usual drink of beer and piece of bread in the middle of both the forenoon and afternoon work turns."

LAW OF FARM-SERVICE.

"Arles."—It is not necessary to give earnest or "arles" to servants when hiring them, unless such be the universal custom of the district; but if such a custom does prevail, the engagement is not complete unless earnest be given. A servant who has received "arles" on engagement is not entitled to dissolve the engagement by returning the "arles."

Period of Engagement.—Farm-servants are presumed to be hired for one year when no specified period of endurance is stipulated, and when no other period is to be presumed from the circumstances of the contract or the custom of the district. If a servant be engaged for a period differing from the customary period, and particularly if the engagement is to endure for more than one year, it is desirable that the agreement be in writing and signed by both parties.

Travelling Expenses.—In ordinary circumstances the master is not bound to pay the expense incurred by the servant in going to the place where the engagement is to be fulfilled, or in returning after the termination of the engagement; but when servants are brought from a great distance, it is usual for the employer to pay the expense of their removal to the place of service.

Board and Lodging.—A master is bound to receive his domestic servant to his or her situation, and to provide the servant with bed and board during the period of the service, unless there be an agreement to the contrary. A male domestic servant may be compelled to reside out of his master's house, the master paying expenses, but a female is entitled to the protection of her master's house. A master is not bound to provide medical attendance or medicine to a servant in sickness, even in cases where the servant is entitled to bed and board from the master. But if the master himself call in the medical man, or authorise this to be done, he will be liable for the bill, and will not be entitled to charge the servant with the amount, or retain it out of the wages.

Duties of Servants.—Servants are bound to serve their masters in everything relating to the situation for which they have engaged themselves. They must be respectful to their master and his family, and in their general conduct avoid actions scandalous or of bad example. They have no right to absent themselves without leave. They are responsible for everything committed to their charge in the routine of their duty, but not for such accidents as are not attributable to their fault. They have no right to draw nice distinctions between what comes within their duty and what does not; but they cannot be employed against their will on any duty really different from the customary duties of the service which they have undertaken, and therefore any unusual branch of service should be matter of special arrangement when the engagement is made.

Payment of Wages, &c., and Breach of Engagement.—Where the amount of wages is not fixed, the customary amount, or such amount as the Court in case of dispute shall fix as reasonable, will be payable. The servant has a right to leave his master and claim wages (and board wages if entitled to board) should his wages not be paid at the terms agreed on or implied from the engagement. The servant may also leave in the event of any other serious breach by the master of the conditions of the employment, but should, where practicable, first endeavour to have the grievance remedied.

Though a farm-servant be engaged by the year, his wages are payable half-yearly.

Sickness or Accident.—If a servant be disabled from performing his service by sickness or accident attributable to his own fault, wages will not be due for the period of disablement, and the servant may even be liable in damages to the master should such be sustained beyond the amount of the wages. But a short temporary disablement in the course of service, not attributable to the servant's fault, will not entitle the master to retain part of the servant's wages, particularly if the illness of the servant has not necessitated the employment of a substitute. What length of disablement will entitle a master to provide a substitute, or to terminate the engagement and cease payment of wages depends upon the circumstances of each case.

If a servant die between terms, his representatives are entitled to wages for the period during which he gave his service.

Death or Bankruptcy of Employer.—When the master dies during the engagement, wages, and also board wages, if the servant be entitled to board, are due to the servant to the next term (not within the period of notice) or to the end of his engagement if that be earlier. But the servant should make reasonable exertions, if called on, to get another situation, and on the new engagement commencing, the wages in respect of the former will cease. While in receipt of wages after his master's death, the servant is bound to continue service.

The effect on the engagement of the master's bankruptcy is similar to the effect of his death. Domestic and farm servants have for long enjoyed in Scotland a preference for their wages for the current term on the death or bankruptcy of their master. In England by statute the same preference is accorded to them as to other servants.

A master may at any time turn off his servant on paying him full wages to the end of the engagement, including board wages, if the servant is entitled to board.

The marriage of a servant is not a ground for dismissal; and if a servant leaves service on marriage, the master may have a claim for any damage which he may sustain against the servant, and in the case of a female servant, against her husband.

Enlistment is not a justification of breach of his engagement by any servant; but may give rise to a claim of damages at the instance of the master. A servant unjustifiably leaving or failing to enter on the master's service may not only forfeit all claim for wages for any period for which service has been rendered; but is liable for the damages resulting from his desertion.

Dismissal.—A servant may be dismissed for immoral conduct, disobedience, or habitual neglect of duty, or for absence without leave, or other serious fault; but remonstrance is expected of a master for the less serious faults before resort is had to dismissal. Legal dismissal forfeits the right of the servant to wages even for the period of actual service; but in some cases, where the dismissal, though justifiable, has not been for the gravest fault, and the forfeiture of wages would be disproportionate to wages earned, the Court has held that the servant is entitled to wages for the period of actual service. A servant is bound to leave, when dismissed even without sufficient or any cause, and by leaving quietly does not forfeit right to compensation for wrongous dismissal.

Notice of Leaving.—If a master wishes to part with a servant, or the servant wishes to leave his situation, at the expiry of the engagement, reasonable warning must be given, unless the local custom is to give no warning. The period of warning requisite in the case of agricultural and domestic servants, engaged for a year or for half a year, is forty days. If timeous warning be not given on either side, the engagement will be held to be renewed for one year, or such less period as may be usual in the particular occupation and locality.

Character.—A master is not bound to give a servant a character, or to state his reason for withholding it. If he knowingly give an untrue character, he will be responsible for the damages consequent on his act. But if, when asked for a character, he gives it to the best of his belief, he will not be liable to the servant in damages, although the character be unfavourable and injurious to the servant.

CARE OF IMPLEMENTS.

Farmers are in many cases not so careful as they ought to be in protecting their implements from injury, by exposure to the weather. Implements are used both within and without doors. Those used without doors may be divided into those in use every season, and those only occasionally. Implements frequently in use upon the soil cannot be otherwise than constantly exposed to the weather; and fortunately they are of simple construction, and are less affected than those of complicated construction, which are used for a short time at certain seasons.

The implement most frequently in use is the plough. Being now made of iron, it can withstand exposure. Harrows, also frequently in use and much exposed to the weather, are now made of iron. Not being required in winter, they are placed in the implement-house. The tines should be sharpened just before the commencement of the oat-seed in spring. The roller being only occasionally in use, in rolling young grass and spring crops, and pulverising the soil in summer, is replaced in its shed whenever its services are no longer wanted. The small double mould-board ploughs, being used in spring and summer, should be placed in the implement-house before winter sets in, scraped clean of earth, and have the irons repaired.

There are few implements which receive less regard when not in use than scufflers and grubbers. They are often allowed to remain at the sides of head-ridges and corners of turnip and potato fields, perhaps the whole winter. Being made of iron, they do not suffer much from weather; but having many small parts—tines, coulters, wedges, screw-bolts—they are best preserved in the implement-house, after having been repaired.

Delicately constructed machines—such as grass-seed sowing, drill-sowing, turnip-sowing—are seldom allowed to remain longer in the field than in use, but often remain unheeded at the steading for a considerable time. Instead of, as is often the case, being taken to the stackyard and covered with straw, they should be repaired, taken to pieces and cleaned, the journals greased, and the separate parts stowed away in the implement-house. The small manual implements, turnip-hoes, spreading-graips, dung-hawks, hay-knives, scythes, if not placed in the implement-house whenever out of use, are liable to be lost.

Of all implements, carts receive the most neglect. Their axles are not greased, their bodies and wheels unwashed, holes in the bottom or sides get enlarged, and the tire of a wheel becomes loose, till some day it flies off, to the risk of breaking down the felloes. The threshing-machine should be cleaned out every time a different sort of corn is threshed, otherwise samples will be impure. The gudgeons are oiled every time the mill is in use. Wherever a repair is required, it should be done immediately, otherwise a serious and expensive fracture may ensue.

Holes in sacks and in barn and chaff sheets should be instantly repaired by patching and darning; and a broken mesh in a riddle or a hole in a "wecht" or basket should be at once repaired.

Implement-house.

The fitting up of the implement-house, for the accommodation of the finer and smaller implements, should be so arranged as to have the floor unencumbered, and give free access to every implement required at a time. To effect this most easily, the house should extend from the floor to the roof. The floor is flagged to prevent rusting of iron in the implements. A wooden floor should be placed halfway between the ground and roof to form a loft, covering only two-thirds of the area of the house, and having one trap-stair to ascend to it. Both floors contain a large number of things, while the height to the roof admits of long forks, shafts, feering-poles, &c., being put into a corner.

Wheels, short shafts, and angular pieces of iron are best placed against a wall upon strong nails. Articles of length, as sowing-boxes, are best sup-

ported against a wall upon brackets. Small articles of iron and other material are best kept upon shelves. Hand-hoes and weed-hooks are best placed in framed stands. Scythes are best suspended from the balks. The bodies of small ploughs, grubbers, and scufflers should be placed along the foot of the walls.

If every implement were put into its own place at the end of its season, confusion would be avoided in seeking for them, and many more articles find room in the implement-house when well arranged, than when things are put down anywhere, without regard to order.

The cart-shed forms a good store for large implements; and were cross-beams put upon the wall-heads, they would contain many others.

Neglect of implements may fairly be imputed to the steward. Were he to give strict orders that every implement out of use shall be put into the implement-house, that every one may know where to find it when again wanted, and to see that his orders are obeyed, there would be no waste of time in seeking for anything—there would be no loss of implements or parts of them—and the implements themselves would last much longer, to the manifest advantage of the farmer, and to the steward himself in the long-run.

FARM BOOK-KEEPING.

It is generally believed that farmers have no regular system of book-keeping. The belief is true in regard to farmers as a class; but many farmers have correct sets of books, and many more now keep books than in former times.

Difficulties of Farm Book-keeping.—But, at best, farmers cannot keep a perfect set of books as mercantile men can. It would be impracticable for them to put a value on every article they use on the farm; for consider how a farm is conducted. The farmer, for example, cannot estimate the value of every stone of straw given daily to his live stock as fodder or litter. He cannot estimate the various amount of labour, manual and mechanical, bestowed on the land before it yields its produce. He cannot estimate the value of manure when first taken to the dunghill, or then estimate it again when applied to the soil after being fermented. He cannot put a value on every turnip, every handful of corn or forage, and every mouthful of grass his live stock consume. The weight of all these articles *could* be ascertained by the steelyard; but of what use would the estimate of their weight and money-value be, since they are not sent to market and turned into cash, except in farms in the neighbourhood of large towns? Such an attempt at estimation would involve the labour of many men, and incur the disbursement of a large amount of wages. Estimation of such items may amuse the leisure hours of the amateur or the investigator, but they would not suit the matter-of-fact working business of a farmer.

Common-sense Book-keeping.—The common-sense view of the matter is this: Let the farmer keep such books as will acquaint him whether the balance of produce and of cash is greater or less this year than in the last. The theory of a system of book-keeping for a farmer is simply this: Let the farmer take an *inventory* and *valuation* of his live stock, implements, crops, cost of labour, and debts due to and by him at the beginning of every agricultural year, and he will see whether his capital has increased or diminished in the bygone year. Let him keep a *cash-book*, which will inform him whether he has received or paid away more cash in the course of the year. Let him have a *day-book*, into which is inserted every transaction as it occurs. It is clear that a knowledge of all these particulars will acquaint him with the real state of his affairs at the beginning of every agricultural year. Here are samples of inventory:—

INVENTORY AND VALUATION OF STOCK ON 1ST OCTOBER 1889.

Farm 500 acres under the mixed husbandry.

	£ s. d.	£ s. d.
I. CASH—		
On hand	40 0 0	
In British Linen Co.'s Bank	300 0 0	
		340 0 0
II. IMPLEMENTS		300 0 0
III. HORSES—		
14 horses, at £25		350 0 0
IV. CATTLE—		
1 Shorthorn bull	20 0 0	
6 Shorthorn cows, at £12	72 0 0	
10 steer calves, at £4	40 0 0	
5 heifer calves, at £3	15 0 0	
15 yearlings, at £8, 10s.	127 10 0	
		274 10 0
Carry forward		£1264 10 0

	£	s.	d.	£	s.	d.
Brought forward				1264	10	0
V. SHEEP—						
200 Leicester breeding ewes, at 32s.	320	0	0			
60 Leicester draft ewes, at 32s.	96	0	0			
290 Leicester hoggs, at 21s.	304	10	0			
320 Half-bred wethers, at 30s.	480	0	0			
3 Leicester tups, at 60s.	9	0	0			
				1209	10	0
VI. PIGS—						
3 sows, at 60s.	9	0	0			
1 boar, at 60s.	3	0	0			
20 pigs, at 22s.	22	0	0			
				34	0	0
VII. CORN—						
11 stacks wheat, 20 qrs. each, 220 qrs. at 36s.	396	0	0			
10 " barley, 30 each, 300 at 20s.	300	0	0			
17 " oats, 40 each, 680 at 16s.	544	0	0			
				1240	0	0
VIII. SEED AND LABOUR—						
Upon 100 acres of turnips at 70s. per acre				350	0	0
IX. DEBTS DUE ME AS PER LEDGER—						
James Marrowman	30	0	0			
Thomas Butters	45	0	0			
				75	0	0
				4173	0	0
X. I OWE TO MY LANDLORD—						
Half-year's rent due Martinmas 1889	500	0	0			
" " Whitsunday 1890	500	0	0			
				1000	0	0
CAPITAL IN 1889				£3173	0	0

INVENTORY AND VALUATION OF STOCK AT 1ST OCTOBER 1890.

We shall suppose this to be the inventory and valuation of stock at the beginning of the succeeding year, 1890.

	£	s.	d.	£	s.	d.
I. CASH—						
On hand	40	2	7			
In open account with B. L. Co.'s Bank	1125	0	0			
				1165	2	7
II. IMPLEMENTS				300	0	0
III. HORSES, 14 at £25				350	0	0
IV. CATTLE—						
1 Shorthorn bull, at £20	20	0	0			
6 Shorthorn cows, at £12	72	0	0			
15 calves, at £5, 10s.	82	10	0			
14 yearlings, at £11	154	0	0			
20 yearlings, at £8	160	0	0			
				488	10	0
V. SHEEP—						
200 Leicester breeding ewes, at 32s.	320	0	0			
101 Leicester draft ewes and gimmers, at 30s.	151	10	0			
297 Leicester hoggs, at 20s.	297	0	0			
200 Half-bred hoggs, at 15s.	150	0	0			
				918	10	0
VI. PIGS—						
3 sows, at 60s.	9	0	0			
1 boar, at 60s.	3	0	0			
32 pigs, at 22s.	35	4	0			
				47	4	0
VII. CORN—						
50 acres of wheat, 3½ qrs. per acre=175 qrs., at 30s.	262	10	0			
50 acres of barley, 4½ qrs. per acre=225 qrs., at 20s.	225	0	0			
100 acres of oats, 6½ qrs. per acre=600 qrs., at 16s.	480	0	0			
				967	10	0
VIII. SEED AND LABOUR on 100 acres of turnips, at 70s. per acre				350	0	0
IX. DEBTS DUE ME AS PER LEDGER—						
The Shepherd				2	15	0
				4589	11	7
Carry forward				£4589	11	7

	£	s.	d.	£	s.	d.
			Brought forward			4589 11 7
X. I OWE TO MY LANDLORD—						
Half-year's rent due Martinmas 1889			500	0	0	
" " Whitsunday 1890			500	0	0	
						1000 0 0
						3589 11 7
CAPITAL IN 1890						
" 1889						3173 0 0
Gain on crop 1889						£416 11 7

On comparing the two inventories, we find that the capital has increased by £416, 11s. 7d. in the year from 1st October 1889 to 1st October 1890.

We do not propose giving the elaborate details of a whole year of a farm, of which the foregoing are the inventories. For those who have not time to keep more detailed accounts, a simpler system may be adopted, showing a correct result in so far as money transactions are concerned—the basis of the system being that all sales and purchases or sums due, such as rent, are entered in a Day-book (whether received or paid or not). Every entry in this Day-book is posted to its individual ledger account, and when the transaction is settled it passes through the Cash-book, from which it is posted to the Ledger. The system is one that does not enter into the settlement of accounts between buyer and seller, but shows the balance on each branch of receipt and expenditure. The balancing of such Ledger, combined with the estimated value of crop and stock, would thus show the profit or loss for any period that may be wanted.

This is the system which was illustrated and recommended in former editions of this work, and although other systems may be better or as good in certain respects, yet it is well thought of by many farmers, and is reproduced in the original form.

To carry out this system the books required are :—

1. DAY-BOOK, containing a record of sales and purchases, and of moneys due.
2. CASH-BOOK, containing a record of the receipt or payment of the sums referred to in the Day-book.
3. LEDGER, containing the combined entries in the two previous books.

A specimen of each kind of book is here given, drawn up by an eminent accountant in Edinburgh.

DAY-BOOK.

1889.			Ledger Folio.	*Dr.* £ s. d.	*Cr.* £ s. d.
Mar.	9	To manure purchased, 130 bags Peruvian guano from Dun & Co.	5	128 17 4	
"	13	By live-stock sales, 78 sheep sold to—	3		
		J. Tod £174 10 3			
		6 cattle, do. 115 0 0			
		7 pigs, do. 25 15 0			
					315 5 3
"	16	" crop sold, J. Steel & Sons, 4 tons potatoes, at 37s. 6d.	2		7 10 0
"	19	To rent and taxes, poor-rates for year to Whitsunday 1889	8	4 19 11	
"	20	By crop sold, J. Barr, 5 tons potatoes, at 37s. 6d.	2		9 7 6
"	21	To live stock purchased, R. Buist, for 11 pigs, £22, custom and toll, 5s.	4	22 5 0	
"	27	" crop purchased, G. Jack, for 5 tons seed-potatoes £13 15 0	1		
		Railway carriage of do. 1 9 2			
				15 4 2	
April	2	" manures purchased, M'Lean & Co., for 53 bags nitrate of soda	5	53 13 11	
"	5	" crop purchased, Roughead & Co.—	1		
		168 lb. cow-grass, at 9d. £6 6 0			
		174 " red clover, at 7½d. 5 8 9			
		58 " alsike, at 18. 6d. 4 7 0			
		29 bush. annual rye-grass, at 4s. 6d. 6 10 6			
		29 " Italian rye-grass, at 5s. 9d. 8 6 9			
		25 bags, at 6d. 0 12 6			
				31 11 6	
"	25	By crop sold, J. & J. Tod, for 14½ quarters wheat, at 46s.	2		33 7 0
"	30	To servants' wages, J. King, for 2½ bags meal, at 43s.	7	5 7 6	
May	2	By crop sold, Lindsay & Son, 29 quarters barley, at 37s.	2		53 13 0
"	19	To crop purchased, J. Elder, for 1 cart hay, 162 stones, at 6½d.	1	4 7 9	
"	25	" servants' wages, for ½ year to Whitsunday 1889—	7		
		J. Kirk £14 0 0			
		R. Gardiner 12 0 0			
		J. Allan 12 10 0			
		J. Gray 11 0 0			
		J. Thomson 12 10 0			
				62 0 0	
"	"	" manure purchased—	5		
"	"	J. Raeburn, 6 tons 6½ cwt. stable-manure, at 6s. £2 1 0			
"	"	W. Dickson, 144¾ tons, at 7s. 50 13 3			
"	"	J. Harley, 122 tons 9½ cwt., at 7s. 42 17 5			
"	"	P. Binnie, 106½ tons, at 7s. 37 5 6			
				132 17 2	
June	1	" rent and taxes—	8		
		Rent of farm for crop 1888 £615 0 0			
		Less property-tax 15 0 0			
				600 0 0	
"	"	To servants' wages, J. Young, 1 day threshing turnip-seed, at 4os.	7	2 0 0	
"	"	" implements, harness, &c., W. Bell, for repairs on harness	6	8 0 0	
"	"	" do., D. Grant, for do., on ploughs, &c.		19 10 0	
"	2	By crop sales, Jeffrey & Co., for 100 qrs. barley, at 40s.	2		200 0 0
Sept.	26	" do., J. Bell, for 60 acres potatoes, at £20	2		1200 0 0
"	30	" live-stock sales, J. Smith, for 10 pigs, at £3.	3		30 0 0
"	"	" crop sales, R. Mackintosh, for 60 bush. turnip-seed, at 20s.	2		60 0 0
Nov.	21	To implements, &c., D. Robertson, for repairs on sheds, &c.	6	12 8 3	
1890.					
Jan.	9	" manures purchased, police commissioners, for 108 tons manures	5	19 2 6	
Feb.	13	By live-stock sales, Buist, for 1 pig	3		3 10 0
"	27	To crop purchased, J. Bell, for 7 bolls potatoes, at 16s.	1	5 12 0	
"	28	By crop sales, K. Mackenzie, for 2 qrs. oats, at 32s.	2		3 4 0
"	"	To live stock purchased, Buist, for 11 pigs	4	22 0 0	
				1149 17 0	1915 16 9

CASH-BOOK.

1889.			Ledger Folio.	*Dr.* £	s.	d.	*Cr.* £	s.	d.
Mar.	9	By manure paid, Dun & Co., for guano	5				128	17	4
"	"	To Bank of Scotland, drawn	10	128	0	0			
"	13	" live-stock sales, received from J. Tod	3	315	5	3			
"	"	By Bank of Scotland, paid in	10				315	0	0
"	"	" miscellaneous expenses, paid commission sale of stock	9				5	3	9
"	19	" rent and taxes, paid poor-rates for year to Whitsunday 1889	8				4	19	11
"	20	To crop sold, received from J. Barr	2	9	7	6			
"	"	By miscellaneous expenses, paid tolls, &c., of potatoes	9				0	7	6
"	27	" crop purchased—	1						
		Paid G. Jack, for seed-potatoes £13 15 0							
		Railway carriage of do. 1 9 2							
							15	4	2
April	2	" manures purchased, paid M'Lean & Co. for nitrate of soda	5				53	13	11
"	"	To Bank of Scotland, drawn	10	50	0	0			
"	5	By crop purchased, paid Roughead & Co. for grass seeds	1				31	11	6
"	30	" servants' wages, paid J. King for meal	7				5	7	6
May	2	To crop sold, received from Lindsay & Son for barley	2	53	13	0			
"	"	By Bank of Scotland, paid in	10				50	0	0
"	25	" servants' wages, paid half-year's wages to Whitsunday 1889	7				62	0	0
"	"	To Bank of Scotland, drawn	10	60	0	0			
"	"	By manure purchased, paid—	5						
		J. Racburn £2 1 0							
		W. Dickson 50 13 3							
		J. Harley 42 17 5							
		P. Binnie 37 5 6							
							132	17	2
"	25	To Bank of Scotland, drawn	10	130	0	0			
June	1	By rent and taxes, paid—	8						
		Rent of farm for crop 1888 £615 0 0							
		Less property-tax 15 0 0							
							600	0	0
"	"	To Bank of Scotland, drawn	10	600	0	0			
"	"	By servants' wages, paid J. Young	7				2	0	0
"	"	" implements and harness, &c., paid W. Bell for repairs	6				8	0	0
"	"	" do., paid D. Grant for do.					19	10	0
"	2	To crop sales, received from Jeffrey & Co. for barley	2	200	0	0			
"	"	" do., received from J. Bell		1200	0	0			
"	"	By Bank of Scotland, paid in	10				1200	0	0
Sept.	30	To live-stock sales, received from J. Smith for pigs	3	30	0	0			
"	"	By miscellaneous expenses, paid commission to J. Smith on sale of pigs	9				0	15	0
"	"	" Bank of Scotland, paid in	10				30	0	0
Nov.	21	" implements, &c., paid D. Robertson for repairs	2				12	8	3
1890.									
Jan.	9	" manure purchased, paid police commissioners	5				19	2	6
Feb.	13	To live-stock sales, received from Buist	3	3	10	0			
"	28	" crop sales, received from K. Mackenzie	2	3	4	0			
"	"	By live stock purchased, paid Buist for pigs	4				22	0	0
"	"	To Bank of Scotland, drawn	10	22	0	0			
"	"	By balance					86	1	3
				2804	19	9	2804	19	9
"	"	To balance		86	1	3			

CROP PURCHASED.

1889.		C.-B. Folio.	£ s. d.	£ s. d.	1889.		D.-B. Folio.	£ s. d.	£ s. d.
Mar. 27	To cash paid G. Jack for seed-potatoes	1	13 15 0		Mar. 27	By 5 tons seed-potatoes from G. Jack	1	13 15 0	
	Railway carriage of do.		1 9 2			Railway carriage of do.		1 9 2	
				15 14 2					15 4 2
April 5	cash paid, Roughead & Co., for grass seeds	1		31 11 6	April 5	Roughead & Co. for—	1		
						168 lb. cow-grass, at 9d.		6 6 0	
						174 " red clover, at 7½d.		5 8 9	
						58 " alsike, at 1s. 6d.		4 7 0	
						29 bush. annual ryegrass, at 4s. 6d.		6 10 6	
						29 " Italian ryegrass, at 5s. 9d.		8 6 9	
						25 bags, at 6d.		0 12 6	
									31 11 6
1890.					May 19	J. Elder, for 1 cart hay, 162 stones, at 6½d.	2		4 7 9
Feb.	balance carried to folio 11			9 9 9	1890.				
					Feb. 27	J. Bell, for 7 bolls potatoes, at 16s.	3		5 12 0
				56 15 5					56 15 5

CROP SALES.

1889.		D.-B. Folio.	£ s. d.	1889.		C.-B. Folio.	£ s. d.
Mar. 16	To 4 tons potatoes, at 37s. 6d., sold to J. Steel & Son	1	7 10 0	Mar. 20.	By cash received from J. Barr for potatoes	1	9 7 6
" 20	" 5 tons do. at 37s. 6d., sold to J. Barr	1	9 7 6	May 2	" cash received from Lindsay & Son for barley	1	53 13 0
April 25	" 14½ quarters wheat, at 46s., sold to J. & J. Tod	1	33 7 0	June 2	" cash received from Jeffrey & Co.	2	200 0 0
May 2	" 29 quarters barley, at 37s., sold to Lindsay & Son	2	53 13 0	" "	" cash received from J. Bell	2	1200 0 0
June 2	" 100 quarters do. at 40s., sold to Jeffrey & Co.	2	200 0 0	1890.			
Sept. 26	" 60 acres potatoes, at £20, sold to J. Bell	2	1200 0 0	Feb. 28	" cash received from K. Mackenzie	2	3 4 0
" 30	" 60 bushels turnip-seed, at 20s., sold to R. Mackintosh	3	60 0 0		" balance to folio 11		100 17 0
1890.							
Feb. 28	2 quarters oats, at 32s., sold to K. Mackenzie	3	3 4 0				
			1567 1 6				1567 1 6

LIVE-STOCK SALES.

1889.		D.-B. Folio.	£ s. d.	£ s. d.	1889.		C.-B. Folio.	£ s. d.
Mar. 13	To sold to J. Tod—	1			Mar. 13	By cash received from J. Tod	1	315 5 3
	78 sheep		174 10 3		Sept. 30	" cash received from J. Smith	2	30 0 0
	6 cattle		115 0 0		1890.			
	7 pigs		25 15 0		Feb. 13	" cash received from Buist	2	3 10 0
				315 5 3				
Sept. 30	10 pigs, at £3, sold to J. Smith	3		30 0 0				
1890.								
Feb. 13	1 pig sold to Buist	3		3 10 0				
				348 15 3				348 15 3

LIVE STOCK PURCHASED.

1890.		C.-B. Folio.	£	s.	d.	1889.		D.-B. Folio.	£	s.	d.
Feb. 28	To cash paid Buist for pigs	2	22	0	0	Mar. 21	By R. Buist for 11 pigs, £22, custom and toll 5s.	1	22	5	0
"	" balance to folio 11		22	5	0	1890. Feb. 28	for 11 pigs	3	22	0	0
			44	5	0				44	5	0

MANURE PURCHASED.

1889.		C.-B. Folio.	£	s.	d.	£	s.	d.	1889.		D.-B. Folio.	£	s.	d.	£	s.	d.
March 9	To cash paid Dun & Co. for guano	1				128	17	4	March 9	By 130 bags Peruvian guano, from Dun & Co.	1				128	17	4
April 2	" cash paid M'Lean & Co. for nitrate of soda	1				53	13	11	April 2	" 53 bags nitrate of soda, from M'Lean & Co.	1				53	13	11
May 25	" cash paid J. Raeburn	1	2	1	0				May 25	" J. Raeburn, 6 tons 6½ cwt. stable-manure, at 6s.	2	2	1	0			
	W. Dickson		50	13	3					" W. Dickson, 144¾ tons, at 7s.		50	13	3			
	J. Harley		42	17	5					" J. Harley, 122 tons 9½ cwt., at 7s.		42	17	5			
	P. Binnie		37	5	6					" P. Binnie, 106½ tons, at 7s.		37	5	6			
						132	17	2							132	17	2
1890. Jan. 9	" cash paid police commissioners	2				19	2	6	1890. Jan. 9	" police commissioners for 108 tons	3				19	2	6
						334	10	11							334	10	11

IMPLEMENTS AND HARNESS.

1889.		D.-B. Folio.	£	s.	d.	1889.		C.-B. Folio.	£	s.	d.
June 1	To cash paid W. Bell for repairs	2	8	0	0	June 1	By W. Bell for repairs on harness	2	8	0	0
Nov. 21	" cash paid D. Grant for repairs	2	19	10	0	Nov. 21	" D. Grant for repairs on ploughs, &c.	2	19	10	0
	" cash paid D. Robertson for repairs	2	12	8	3		" D. Robertson for repairs on sheds, &c.	3	12	8	3
			39	18	3				39	18	3

RENT AND TAXES.

1889.		C.-B. Folio.	£	s.	d.	£	s.	d.	1889.		D.-B. Folio.	£	s.	d.	£	s.	d.
Mar. 19	To cash paid poor-rates for year to Whitsunday 1889	1				4	19	11	Mar. 19	By poor-rates for year to Whitsunday 1889	1				4	19	11
June 1	cash paid rent of farm for crop 1888	2	615	0	0				June 1	" rent of farm for crop 1888	2	615	0	0			
	Less property-tax		15	0	0					Less property-tax		15	0	0			
						600	0	0							600	0	0
						604	19	11							604	19	11

LEDGER.—*continued.*

SERVANTS' WAGES.

1889.		C.-B. Folio.	£	s.	d.	1889.		D.-B. Folio.	£	s.	d.	£	s.	d.
April 30	To cash paid J. King for meal	1	5	7	6	April 30	By J. King for 2½ bags meal, at 43s.	2				5	7	6
May 25	" cash paid wages for half-year to Whitsunday 1888	1	62	0	0	May 25	" wages for half-year to Whitsunday 1889—	2						
June 1	" cash paid J. Young	2	2	0	0		J. Kirk		14	0	0			
							R. Gardiner		12	0	0			
							J. Allan		12	10	0			
							J. Gray		11	0	0			
							J. Thomson		12	10	0			
												62	0	0
						June 1	J. Young, one day threshing turnip-seed, at 40s.	2				2	0	0
			69	7	6							69	7	6

MISCELLANEOUS EXPENSES.

1889.		C.-B. Folio.	£	s.	d.	1889.		£	s.	d.
Mar. 13	To cash paid commission to J. Young on sale of stock	1	5	3	9	Feb.	By balance to folio 11	6	6	3
" 20	" cash paid tolls, &c., for potatoes	1	0	7	6					
Sept. 30	" cash paid commission to J. Smith on sale of pigs	1	0	15	0					
			6	6	3			6	6	3

BANK OF SCOTLAND.

1889.		C.-B. Folio.	£	s.	d.	1889.		C.-B. Folio.	£	s.	d.
Mar. 13	To cash paid in	1	315	0	0	March 9	By cash drawn	1	128	0	0
May 2	" cash paid in	1	50	0	0	April 2	" cash drawn	1	50	0	0
June 2	" cash paid in	2	1200	0	0	May 25	" cash drawn	1	60	0	0
Sept. 30	" cash paid in	2	30	0	0	" "	" cash drawn	2	130	0	0
						June 1	" cash drawn	2	600	0	0
						1890.					
						Feb. 28	" cash drawn	2	22	0	0
							" balance to folio 11		605	0	0
			1595	0	0				1595	0	0

STATEMENT OF TRANSACTIONS FOR YEAR TO FEBRUARY 1890.

Crop sales,	ledger folio 2		£1567 1 6	Crop purchased,	ledger folio 1		£56 15 5
Live-stock sales,	"		348 15 3	Live stock purchased,	" 4		44 5 0
				Manure purchased,	" 5		334 10 11
				Implements and harness,	" 6		39 18 3
				Servants' wages,	" 7		69 7 6
				Rent and taxes,	" 8		604 19 11
				Miscellaneous expenses,	" 9		6 6 3
						£1156 3 3	
				Balance,		759 13 6	
			£1915 16 9			£1915 16 9	

STATE OF BALANCE.

Balance as above	£759 13 6	Due to farm for crop sold, as per ledger folio 2	£100 17 0	
Due by farm for crop purchased, as per ledger folio 1	9 19 9	Balance due by Bank of Scotland, as per ledger folio 10	605 0 0	
Due by farm for live stock purchased, as per ledger folio 4	22 5 0	Balance due to farm, as on cash-book	86 1 3	
	£791 18 3		£791 18 3	

PROFIT AND LOSS ACCOUNT, FEBRUARY 1890.

Horses per inventory	£100 0 0		
Implements do.	87 10 0		
Cattle do.	115 0 0		
Pigs do.	25 10 0		
Sheep do.	68 0 0		
		£396 0 0	
Accounts due to farm	£100 17 0		
In bank	605 0 0		
Cash in hand	86 1 3		
		791 18 3	
		£1187 18 3	
Less due by farm for crop purchased	£9 19 9		
Do. for live stock purchased	22 5 0		
		32 4 9	
CAPITAL, 1890		£1155 13 6	
CAPITAL, 1889		700 0 0	
Profit for year		£455 13 6	

When it is desired to have a detailed account of the disposal of the crop and stock, it is necessary to have sheets ruled on purpose to show all the particulars at a glance. On a farm, say of 500 acres, divided into twenty equal-sized fields of 25 acres each, which should each be named, perhaps by a letter of the alphabet, wrought in a five-course rotation, the

Fields A, B, C, and D,	will be in	turnips.
" E, F, G, and H,	"	wheat and barley.
" I, K, L, and M,	"	first year's grass.
" N, O, P, and Q,	"	second year's grass.
" R, S, T, and U,	"	oats.

On every farm the fields are designated by a particular name. Such a designation is required for each field, otherwise confusion might arise in mistaking the orders given to be executed on any particular field, for any other field.

There should be a plan of the Stack-yard, which should contain a number appertaining to each stack, and the letter or letters of the alphabet of the field or fields upon which the stack was reaped. Such a plan will be found on the following page.

The Corn-accounts show the time when the crop was threshed—the parties to whom it was sold—the uses which were made of it on the farm—the balance of corn on hand at any time in the corn-barn and granary—the weights of the corn, and the prices obtained for it.

CORN-ACCOUNT—CROP 1889.

Date.		Whole Quantity.		WHEAT.	Weight per bushel.	Amount of Produce.				Disposal.				Rate.	Price.
						Clean.		Light.		Used.		Sold.			
		Qrs.	Bu.		lb.	Qrs.	Bu.	Qrs.	Bu.	Qrs.	Bu.	Qrs.	Bu.		£ s. d.
1889.															
Oct. 3	To	62	"	Threshed from field G (stacks 9, 10, 11)		60	5	1	3						
" 4	By	60	"	Sold Isaac Marshall & Son	64							60	"	37/4	112 0 0
		2	"												
" 4	To	21	3	Threshed from field E (stack 1)		21	"	"	3						
		23	3												
" 6	By	7	4	Sown on field A and part of B						7	4				
		15	7												
Nov. 7	To	21	"	Threshed from field E (stack 2)		20	4	"	4						
		36	7												
" "	By	1	6	Bruised for pigs						1	6				
		35	1												
" 11	"	35	1	Sold to John Cuthbert	63							35	1	34/	59 14 3
1890.															
Jan. 9	To	40	"	Threshed from field E (stacks 4 and 5)		38	4	1	4						
" 10	By	7	4	Sown upon field B						7	4				
		32	4												
" 13	"	31	"	Sold to J. Marrowman	63							31	"	35/	54 5 0
		1	4												
Apr. 25	To	62	3	Threshed from field G (stacks 6, 7, 8)		60	"	2	3						
		63	7												
" 28	By	63	7	Sold to John Factor (3 qrs. 7 bu. light)	64							63	7	36/	116 3 1
" 30	To	20	7	Threshed from field E (stack 3)		20	"	"	7						
May 5	By	20	"	Sold to Isaac Marshall & Son	64							20	"	37/	37 0 0
		"	7												
		"	7	Bruised for pigs							7				
						220	5	7	"	17	5	210	"		379 2 4
						7	"					17	5		
				Totals		227	5					227	5		

STACKYARD—CROP 1889.

1. Wheat. Field E.	2. Wheat. Field E.	3. Wheat. Field E.	4. Wheat. Field E.	5. Wheat. Field E.	6. Wheat. Field G.	7. Wheat. Field G.	8. Wheat. Field G.
9. Wheat. Field G.	10. Wheat. Field G.	11. Wheat. Field G.	12. Barley. Field F.	13. Barley. Field F.	14. Barley. Field F.	15. Barley. Field F.	16. Barley. Fields F & H. ½ of each.
17. Barley. Field H.	18. Barley. Field H.	19. Barley. Field H.	20. Barley. Field H.	21. Barley. Field H.	22. Oats. Field R.	23. Oats. Field T.	24. Oats. Field S.
25. Oats. Field R.	26. Oats. Field R.	27. Oats. Field R.	28. Oats. Field S.	29. Oats. Field S.	30. Oats. Field T.	31. Oats. Field T.	32. Oats. Field T.
33. Oats. Field T.	34. Oats. Fields T & U. 2 Loads of U.	35. Oats. Field U.	36. Oats. Field U.	37. Oats. Field U.	38. Oats. Field U.		

Date.		Whole Quantity. Qrs.	Bu.	BARLEY.	Weight per bushel. lb.	Amount of Produce. Clean. Qrs.	Bu.	Light. Qrs.	Bu.	Disposal. Used. Qrs.	Bu.	Sold Qrs.	Bu.	Rate.	Price. £ s. d.
1889.															
Oct. 2	To	32	3	Threshed from field H (stack 21)		31	"	1	3						
" 3	By	6	6	Used for wages (supper barley)						6	6				
		25	5												
Dec. 26	To	30	"	Threshed from field H (stack 20)		28	6	1	2						
		55	5												
" 30	By	50	"	Sold to John Newman	56							50	"	20/	50 0 0
1890.															
Jan. 1	To	5	5												
		29	"	Threshed from field H (stack 19)		28	"	1	"						
		34	5												
" "	By	6	6	Used for wages						6	6				
		27	7												
" "	"	3	5	Light bruised for pigs						3	5				
		24	2												
" 6	"	24	2	Sold to James Marrowman	55							24	2	19/6	22 12 0
" 24	To	31	3	Threshed from field H (stack 17)		30	"	1	3						
" 27	By	30	"	Sold to John Factor	54							30	"	18/	27 0 0
		1	3												
" 30	To	34	4	Threshed from field H (stack 18)		33	4	1	"						
		35	7												
Feb. 3	By	2	3	Light bruised for pigs						2	3				
		33	4												
" "	"	30	"	Sold to John Factor	56							30	"	18/6	27 15 0
		3	4												
" 16	To	14	"	Threshed from field H (top of stack 16)		13	4	"	4						
" "	"	16	3	Do. from field F (top of stack 16)		16	"	"	3						
" 19	"	30	"	Do. from field F (stack 15)		28	"	2	"						
		63	7												
" 24	By	30	"	Sold to Jonathan Cornbuyer	56							30	"	19/	28 0 0
		33	7												
Mar. 15	To	31	"	Threshed from field F (stack 12)		30	"	1	"						
		64	7												
" 17	By	3	7	Boiled for horses						3	7				
		61	"												
" "	"	61	"	Sold to Jonathan Cornbuyer	56							61	"	20/	61 0 0
" 30	To	63	"	Threshed from field F (stacks 13 and 14)		60	"	3	"						
" "	By	6	6	Used for wages						6	6				
		56	2												
April 14	"	9	2	Sown on field C						9	2				
		47	"												
" 25	"	9	4	Sown on field D						9	4				
		37	4												
" "	"	3	"	Boiled for horses						3	"				
		34	4												
" 28	"	27	6	Sold to John Factor	56							27	6	20/	27 15 0
		6	6												
May 23	"	6	6	Used for wages						6	6				
						298	6	12	7	58	5	253	"		244 12 0
						12	7					58	5		
				Totals		311	5					311	5		

Date.		Whole Quantity.		OATS.	Weight per bushel.	Amount of Produce.				Disposal.				Rate.	Price.
						Clean.		Light.		Used.		Sold.			
		Qrs.	Bu.		lb.	Qrs.	Bu.	Qrs.	Bu.	Qrs.	Bu.	Qrs.	Bu.		£ s. d.
1889. Oct. 15	To	65	7	Threshed from field T (stacks 31 and 32)		55	"	10	7						
" "	By	10	7	Used for horses						10	7				
		55	"												
" 22	To	89	2	Threshed from field T (stacks 30 and 33)		80	"	9	2						
		144	2												
" "	By	60	6	Used for wages						60	6				
		83	4												
" "	"	60	"	Sold to Isaac Marshall & Son	43							60	"	16/	48 0 0
		23	4												
" 26	To	40	"	Threshed from fields T and U (stack 34)		35	"	5	"						
		63	4												
Nov. 1	"	45	"	Threshed from field U (stack 38)		39	4	5	4						
		108	4												
" 4	By	80	"	Sold to J. Clay	42							80	"	16/	64 0 0
		28	4												
" 30	"	20	"	Used for horses						20	"				
		8	4												
Dec. 2	To	123	"	Threshed from field U (stacks 35, 36, and 37)		110	"	13	"						
		131	4												
" "	By	80	"	Sold to Thomas Dewar	42							80	"	15/6	62 0 0
		51	4												
" 30	"	19	"	Used for horses						19	"				
1890.		32	4												
Jan. 30	"	20	"	Used for horses						20	"				
		12	4												
Feb. 7	To	120	"	Threshed from field S (stacks 23, 24, and 29)		100	"	20	"						
		132	4												
" 10	"	43	"	Threshed from field R (stack 27)		40	"	3	"						
		175	4												
Mar. 15	By	30	"	Used for horses						30	"				
		145	4												
" "	"	30	"	Sown upon fields N and P (Sandy)						30	"				
		115	4												
" 24	"	31	"	Sown upon fields O and Q (Potato)						31	"				
		84	4												
" 31	"	9	"	Used for horses						9	"				
		75	4												
April 30	"	20	"	Used for horses						20	"				
		55	4												
May 23	To	41	"	Threshed from field S (stack 28)		35	"	6	"						
		96	4												
" 31	By	20	"	Used for horses						20	"				
		76	4												
June 6	To	130	"	Threshed from field R (stacks 22, 25, and 26)		120	"	10	"						
		206	4												
" 9	By	120	"	Sold to Isaac Marshall & Son	43							120	"	16/	96 0 0
		86	4												
" "	"	86	4	In granaries for horses						86	4				
						614	4	82	5	357	1	340	"		270 0 0
						82	5					357	1		
				Totals		697	1					697	1		

The Live-Stock Accounts give, in like manner, the particulars of every species of stock—the disposal of them—the numbers on hand at different periods—the prices obtained and the prices paid for them.

STOCK ACCOUNT—1889.

Date.		Whole No.	CATTLE.	Steers.	Cows.	Calves.	Price. Paid. £ s. d.	Price. Received. £ s. d.
1889.								
Oct. 2	To	1	Bull	1				
" "	"	6	Cows		6			
" "	"	10	Steers rising 1 year old	10				
" "	"	5	Heifers "		5			
" "	"	15	Steers rising 2 years old	15				
		37		26	11			
" 10	"	30	2-year-old steers bought at Yarm, at £7	30			210 0 0	
		67		56				
1890.								
Feb. 20	By	15	Steers sold Adam Butters, at £18	15				270 0 0
		52		41				
" "	To	15	Steers bought at Darlington, at £7	15			105 0 0	
		67		56				
Mar. 20	"	15	Steers bought at Darlington, at £8	15			120 0 0	
		82		71				
" 21	By	14	Steers sold at Newcastle, at £18	14				252 0 0
		68		57				
May 8	"	16	Steers sold at Newcastle, at £14	16				224 0 0
		52		41				
" 15	"	15	Steers sold at Newcastle, at £12	15				180 0 0
		37		26				
June 1	"	15	Steers sold at Edinburgh, at £11	15				165 0 0
		22		11				
" "	To	20	Steers bought at Darlington, at £6, 6s.	20			126 0 0	
		42		31				
Sept. 29	By	1	Heifer died		1			4 10 0
		41			10		561 0 0	1095 10 0
" "	To	15	Calves weaned			15		
						10		
		56				31		
			Total stock of cattle			56		

Date.		Whole No.	SHEEP.	Ewes.	Peeding Sheep.	Hoggs.	Rate.	Price. Paid. £ s. d.	Price. Received. £ s. d.
1889.									
Oct. 2	To	200	Ewes	200					
" "	"	290	Hoggs			290			
" "	"	320	Wethers		320				
" "	"	3	Rams		3				
		813			323				
" 30	By	3	2 hoggs and 1 wether dead		1	2			1 5 0
		810			322	288			
Nov. 30	"	2	Hoggs dead			2			0 10 0
		808				286			
Dec. 25	"	40	Wethers sold to Timothy Wood		40		34/		68 0 0
		768			282				
" 31	"	4	3 hoggs and 1 wether dead		1	3			1 10 0
1890.		764			281	283			
Jan. 1	"	60	Wethers sold to Jacob Keywortb		60		36/		108 0 0
		704			221				
" 30	"	3	Hoggs died			3			1 10 0
		701				280			
Feb. 28	"	2	1 ewe and 1 hogg dead	1		1			0 15 0
		699		199		279			
Mar. 15	"	100	Wethers sold at Edinburgh		100		32/		160 0 0
		599			121				
" 30	"	3	2 ewes and 1 wether dead	2	1				2 0 0
		596		197	120				
Apr. 14	"	120	Wethers sold at Edinburgh		120		35/		210 0 0
		476							
" 30	"	2	Hoggs dead			2			1 0 0
		474				277			
May 30	"	3	2 ewes and 1 hogg dead	2		1			1 0 0
		471		195		276			
June 15	"	170	Clipped hoggs sold at home			170	30/		255 0 0
		301				106			
						195			
			Account altered by addition of Lambs.			301			
July 8	To	200	Breeding ewes and gimmers	200					
" "	"	101	Draft ewes and gimmers		101				
" "	"	170	Wether lambs weaned			170			
" "	"	130	Ewe do. do.			130			
		601				300			
Sept. 27	By	60	Draft ewes sold at St Ninians fair		60		32/		96 0 0
		541			41				
" 30		200	Half-bred wether lambs bought at Melrose			200	14/	140 0 0	
		741				500			
" "	By	3	Hoggs dead			3			1 15 0
		738				497		140 0 0	908 5 0
						41			
						200			
			Total stock of sheep			738			

Date.		Whole No.	Pigs.	Breeding Pigs.	Feeding or store Pigs.	Rate.	Price. Paid. £ s. d.	Price. Received. £ s. d.
1889.								
Oct. 2	To	3	Sows . .	3				
" "	"	1	Boar . . .	1				
" "	"	20	Store pigs .		20			
		24		4				
" 24	"	18	Weaned (2 litters)		18			
		42			38			
Nov. 7	"	8	Weaned .		8			
		50			46			
1890. Jan 1.	By	20	Sold at Edinburgh		20	30/		30 0 0
		30			26			
" "	To	25	Bought at Berwick		25	15/	18 15 0	
		55			51			
May 8	By	48	Sold at Edinburgh		48	30/		72 0 0
		7			3			
June 8	To	30	Weaned (3 litters)		30			
		37			33			
		1	Died		1			
		36			32		18 15 0	102 0 0
			Boar and sows		4			
			Total stock of pigs		36			

ACCOUNT OF CHARGE AND DISCHARGE OF THE INTROMISSIONS OF A— B—, FARMER AT C——, FOR CROP AND YEAR ENDING 1ST OCTOBER 1890.

CHARGE.

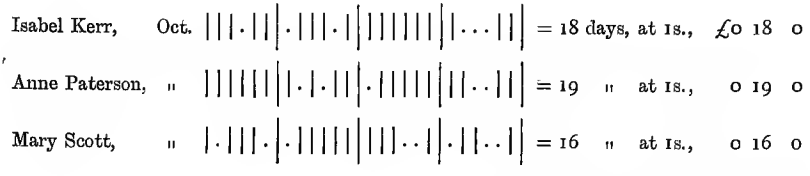
	£ s. d.	£ s. d.
BRANCH I.—Balance on hand at 31st October 1889—		
Cash	40 0 0	
Balance in account with British Linen Bank .	300 0 0	
		340 0 0
BRANCH II.—Debts due me at 1st October 1889, per last account		75 0 0
BRANCH III.—Corn sold—		
Wheat sold, per corn account	379 2 4	
Barley do. do.	244 12 0	
Oats do. do.	270 0 0	
		893 14 4
BRANCH IV.—Live stock sold:		
1. *Cattle*—		
Cattle sold, per stock account .	1095 10 0	
2. *Sheep*—		
Sheep sold, per stock acconnt .	908 5 0	
3. *Wool*—		
Wool sold	153 4 0	
4. *Pigs*—		
Pigs sold, per stock account . .	102 0 0	
		2258 19 0
Sum of charge		3567 13 4

DISCHARGE.

		£ s. d.	£ s. d.	£ s. d.
	Branch I.—Rent, Taxes, and Insurance.			
1890.	1. *Rent*—			
Jan. 24	By paid half-year's rent, due at Martinmas		500 0 0	
June 24	By do. due at Whitsunday		500 0 0	
			1000 0 0	
1889.	2. *Taxes*—			
Nov. 22	By Schoolmaster's stipend, for year ending this date	1 17 6		
1890.				
May 28	By poor-rates for year, to Whitsunday 1890	25 0 0		
Aug. 26	By assessed taxes	7 18 1		
" "	By income-tax	11 0 8½		
			45 16 3½	
1889.	3. *Fire Insurance*—			
Nov. 20	By premium paid Phœnix, for one year		7 17 9	
				1053 14 0½
	Branch II.—Live Stock Bought.			
	1. *Cattle*—			
" "	Cattle bought, per stock account		561 0 0	
	2. *Sheep*—			
" "	Sheep bought, per stock account		140 0 0	
	3. *Pigs*—			
" "	Pigs bought, per stock account		18 15 0	
				719 15 0
	Branch III.—Farm Working.			
1890.	1. *Seed bought*—			
June 9	By clover and grass seed account		50 10 0	
" "	By turnip-seed account		12 0 0	
" "	By 10⅛ qrs. of beans, at 22s.		11 2 9	
1889.	2. *Furnishings and Repairs*—			
Nov. 7	By John Irons, for castings for mill	6 0 0		
1890.				
Jan. 7	By ironmonger's account, for past year	8 0 0		
" "	By sundry accounts—			
	Farrier £5 0 0			
	Roper 2 10 0			
	Mason 4 10 4			
	Slater 4 17 10			
		16 18 2		
Feb. 20	By 3 tons of cake from James Cuthbert, at £8 per ton	24 0 0		
April 1	By saddler's account, for past year	8 0 0		
" 22	By lime, bought at Sunderland kilns	9 5 3		
July 1	By 15 tons of guano, at £9 per ton	135 0 0		
" "	By 3 loads of palings, at 10s.	1 10 0		
			208 13 5	
1889.	2. *Labour and Oatmeal*—			
Oct. 27	By harvest expenses	71 8 10		
" "	By 5 sacks of oatmeal, at 26s.	6 10 0		
Nov. 22	By Labour account, for half-year to date	134 11 6½		
May 26	By do. do. do.	130 7 8		
July 1	By William Young for use of his stallion	1 2 6		
			344 0 6½	
				626 6 8½
	Branch IV.—Debts due me.			
1890.				
Sept. 30	By shepherd, due me for fallen mutton			2 15 0
	Branch V.—Balance.			
	Cash on hand		40 2 7	
	Balance at credit in account with the British Linen Company		1125 0 0	
				1165 2 7
	Sum of discharge			3567 13 4

Memorandum-book.—Every farmer ought to be provided with a pocket memorandum-book, to contain every item, great or small, connected with the farm, whether involving cash or not. Without such a memorandum, confusion may arise from broken promises, forgetfulness, or neglect. At one time it was customary in farmers to trust solely to the memory to retain their transactions; and we have heard extraordinary instances of accuracy in farmers who transacted business of the most multifarious character by memory alone; nevertheless, the safer plan for every farmer is to jot down every particular incident in the memorandum-book that involves the interests of others as well as his own.

Labour-books.—Here is a simple form of keeping the field-workers' daily labour-account:—



Between the long strokes is comprehended one week; the short strokes are the days of the week. Suppose the account runs for the half-year across two ruled pages of the book. The name of the field-worker is written on the left hand. A short stroke is made for every full day the field-worker has worked. If she has only worked ½ day, the ½ is marked. If ¾ of a day, ¾ is marked. If she has not been working, then 1 dot · is made. Thus at a glance is seen the work done every week, as well as when work was not done. The account thus kept for the half-year, the days are summed up and calculated at the rate of wages per day, and the gross amount of the half-year's earnings is brought out distinctly.

A proprietor not living on the estate in which his home-farm is situated, is desirous of knowing how the work goes on on his distant farm. Here is an example of a labour-book which would suit his purpose. It contains columns indicating the number of hours each labourer is employed daily, with a weekly summary showing the total number of days and hours for each person employed, and rate of wages, from which the amounts earned can easily be calculated.

LABOUR-BOOK.

Date of First Day of Week.	Work-People's Names.	Hours each Day.						Time each Week.		Rate per Day.		Sum.		
		M.	T.	W.	Th.	F.	S.	D.	H.	s.	d.	£	s.	d.

FINAL EXHORTATIONS.

When the young farmer is settled on his farm, he undertakes certain duties and obligations which he must fulfil.

Work well advanced.—It is an important duty of a farmer of arable land to have his field operations in an advanced state at all seasons. If by negligence a delay of an operation takes place for one day or two in its proper season, it cannot be executed in the best way; and if then overtaken by bad weather, the risk is incurred of a deficient crop. When field operations are in advance, a few days' waiting can do no harm; and when finished in a good state, a well-founded hope may be cherished of a good return. To secure an advance in labour, the working stock should be adequate to complete every operation in its season. Time lost then can never be made up by inefficient means of labour.

Efficient and Well-arranged Labour.—That labour may be employed most economically, the farmer should have the ingenuity to arrange the labourers to work for one purpose. For example, when ploughs are working by themselves, and the field-workers by themselves, they do their respective works efficiently; but when ploughmen and field-workers are at the same work—manual and mechanical labour combined—the strength of each party should be proportioned to produce the desired result in a given time. To make the co-operation perfect, the horses should be well matched, sufficiently fed, and judiciously wrought; and as a counterpart, the field-workers should be active, willing, strong, and skilful.

Good Implements.—Still further means to the same end, the best-constructed implements should be selected, for skilful labourers require the best implements, and the horses use them with the greatest ease. Ploughmen, horses, implements, and field-workers are the working stock of a farm; and unless all these are maintained in the most efficient state, the farmer cannot expect his operations to be executed in the best manner.

Attention to Live Stock.—Besides the land, the farmer must bestow attention on his live stock. In winter, those confined in the steading should have abundance of food at regulated hours, be comfortably lodged, and carefully tended, and those in the fields provided with shelter and food. Turnips should be stored in the best state, in case of frost ensuing. In summer, pasturing the grass fields requires attention, both on account of the pasture itself and the stock upon it, with a sufficient supply of water. Any stock on green forage requires more particular attention.

Marketing Corn.—As long as the corn-market is active in winter, the farmer should attend to the threshing and cleaning of grain, for the double purpose of supplying his stock with straw, whether with fodder or litter, and of disposing of the corn. It is not a farmer's duty to speculate on his own corn in the stack; for the live stock have a legitimate demand upon the straw, and if by speculation they are deprived of fodder and litter, so is the land of manure; and, on the other hand, if he thresh faster than the stock can consume it, the straw suffers deterioration as fodder and litter, and as manure. The corn presented at the market should be in a perfect state of cleanliness, not only on account of the farmer's own sake of acquiring the character of a clean dresser of grain, but for his demanding the highest price.

Bearing towards Work-people.—In his bearing to his work-people the farmer should be kind and reasonable. He should not be constantly rebuking. A fault should be checked; and one arising from the head, not the heart, should be gently dealt with. Theft and falsehood should never be forgiven, and the delinquent should be got rid of at the first term, for no trust can ever be confided in him. When a ploughman quarrels seriously with his horses, the safest expedient is to cause him to put them into the stable till next day, when his temper will have calmed down, and the affront will have served to curb it. A mere severe rebuke at the time, with

allowance to continue at work, will never convince him that he was wrong. The wives and children of married men are frequently troublesome on a farm; when a man cannot control his own household, he should be parted with. Much more work will be obtained from field-workers by a little indulgence than by over exaction of work. A short rest at mid-yokings has a wonderfully encouraging effect, especially upon field-workers.

Punctual in paying Wages.—The farmer should be punctual in his payments to his servants at the specified terms; for if he be not, he loses control, and places himself in their power in many ways. Work-people calculate on laying out their earnings when they become due; and on being disappointed, it causes them much inconvenience and vexation of spirit. Women especially feel the disappointment keenly.

Relation to Neighbours.—In relation to his neighbours, the farmer should be punctual to his engagements. If he promised to buy or sell any commodity with a person on a given day and hour, he should keep his appointment. If he has promised to settle accounts with any tradesman at a given time, he should do so without fail. A few breaches of promise soon affect a man's character where he resides, and a few more may ruin his veracity, and even credit.

Recreation and Instruction.—The farmer should provide himself with recreation and instruction at home. Recreation he will find in his own family, in field-sports and manly exercises, and in visits to and from friends at a distance, and neighbours around. For instruction he must have recourse to books, papers, and conversation. If he does not provide attractions at home, he will go elsewhere for them, and neglect his farm.

It is a common remark among townspeople, that farmers, as a class, read little. If they knew the habits of farmers as well as we do, they would consider this no obloquy. Little do townspeople know the fatigue which is endured in early rising and constant exercise in the fields on foot, when even ordinary operations are going on in summer, and especially when improvements are on hand. The lassitude consequent on fatigue which overtakes the frame in the evening is great. It is then physically impossible to betake to reading on a subject that requires thought. The desultory newspaper affords the most fitting reading until the hour of bed, which must be early. In winter it is different, and at that season it is not true that the farmer does not read—for many read much; and as they advance in years, much leisure is given to reading. We have only to peruse the discussions in farmers' clubs to be satisfied that the present race of farmers read, and have read to good purpose.

Townspeople also believe that the artisans of towns are much more intelligent than the labouring people of the country. There are different kinds of intelligence. We have had many opportunities of conversing with both classes of workpeople, and we like to do it, but never could observe the superior intelligence of the town artisan. The country labourer is a keen observer of nature: he knows the symptoms of the weather, different kinds of soil, of rocks, of trees, the habits of many animals, and the properties of the plants he cultivates; and as to the shepherd, no ordinary artisan is his superior. The manufacturer is favourably contrasted with the farmer, since he avails himself of every improved piece of machinery, while the farmer neglects similar opportunities for improving his business. The cases are not analogous. The manufacturer knows with certainty that machinery and materials which suit a co-manufacturer will suit him also; but the farmer has no certainty of any implement or manure suiting his own climate, soil, situation, and locality, until he has tried it—and it is only once in a year that he can try it. He prudently waits the approval of others before he adopts it.

In catering for mental food, the young farmer should take the periodicals connected with the agricultural societies of the kingdom, as well as those in any class of literature which suits his taste. Agricultural chemistry and physiology, animal and vegetable, he should not neglect. His local newspaper he patronises; and, above all, he should have a good agricultural paper. It is a great matter for the farmer, especially the young one, to take a short ramble now

and then, in summer, in Continental countries. Travel expands the mind, presents new objects, refines intelligence, corrects prejudices, and adds many materials to happiness.

In parting with the young farmer, now no longer a pupil, we would exhort him always to maintain independence of mind and honourable behaviour. He forms the connecting and binding link between the proprietor and labourer of the soil. He thus belongs to that middle class which forms the staple portion of the community. In taking leave of our young friends, we do so in the anxious and heartfelt hope that this effort in the cause of agriculture may prove as profitably instructive and as practically useful as have the former editions of this work.

INDEX.

*** *Volume I. embraces Divisions* 1 *and* 2; *Volume II., Divisions* 3 *and* 4; *Volume III., Divisions* 5 *and* 6.

PRINTED BY WILLIAM BLACKWOOD AND SONS.

DETACHED PASTORAL FARM STEADING

FOR REARING CATTLE

Fig 1

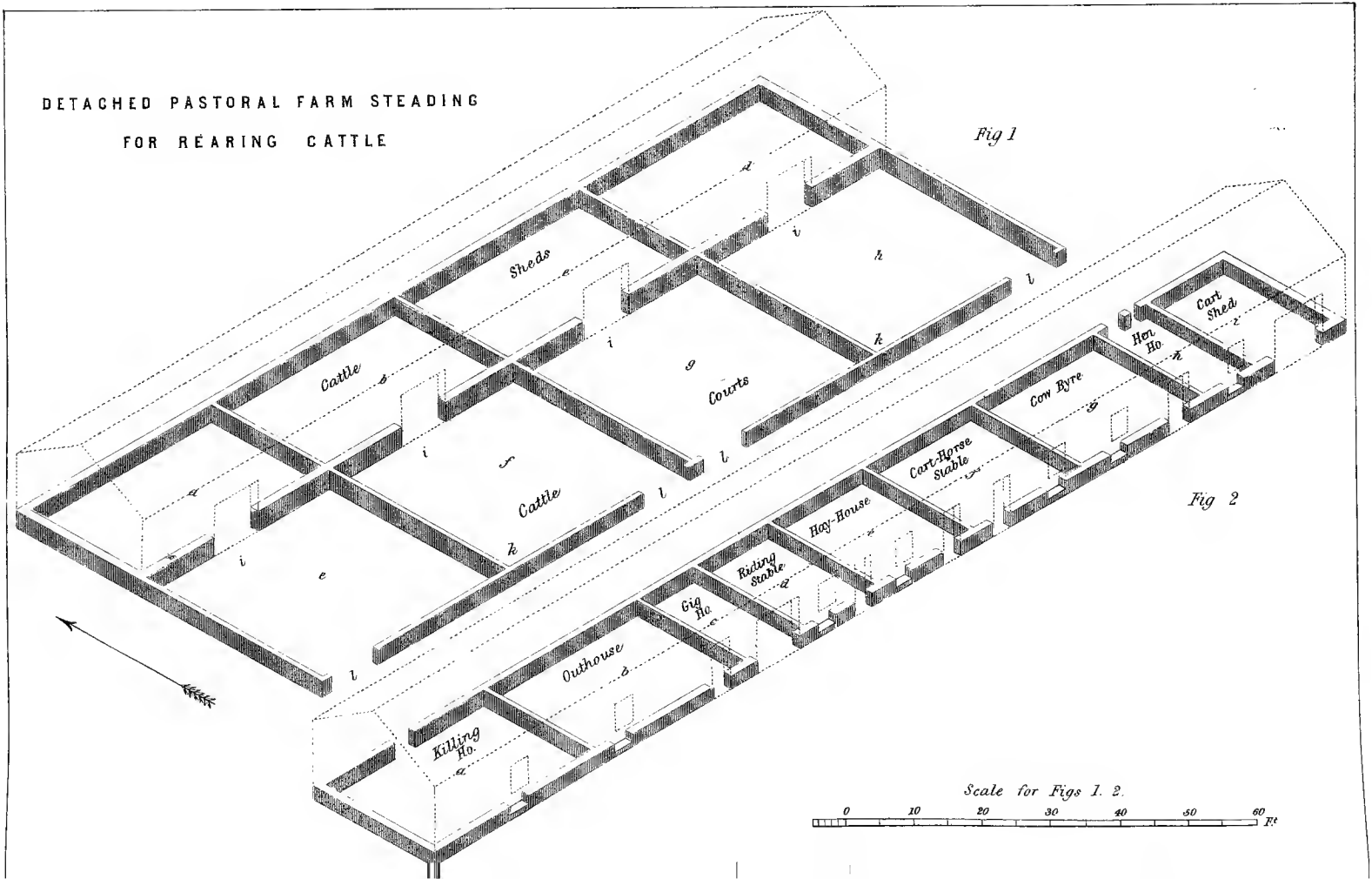


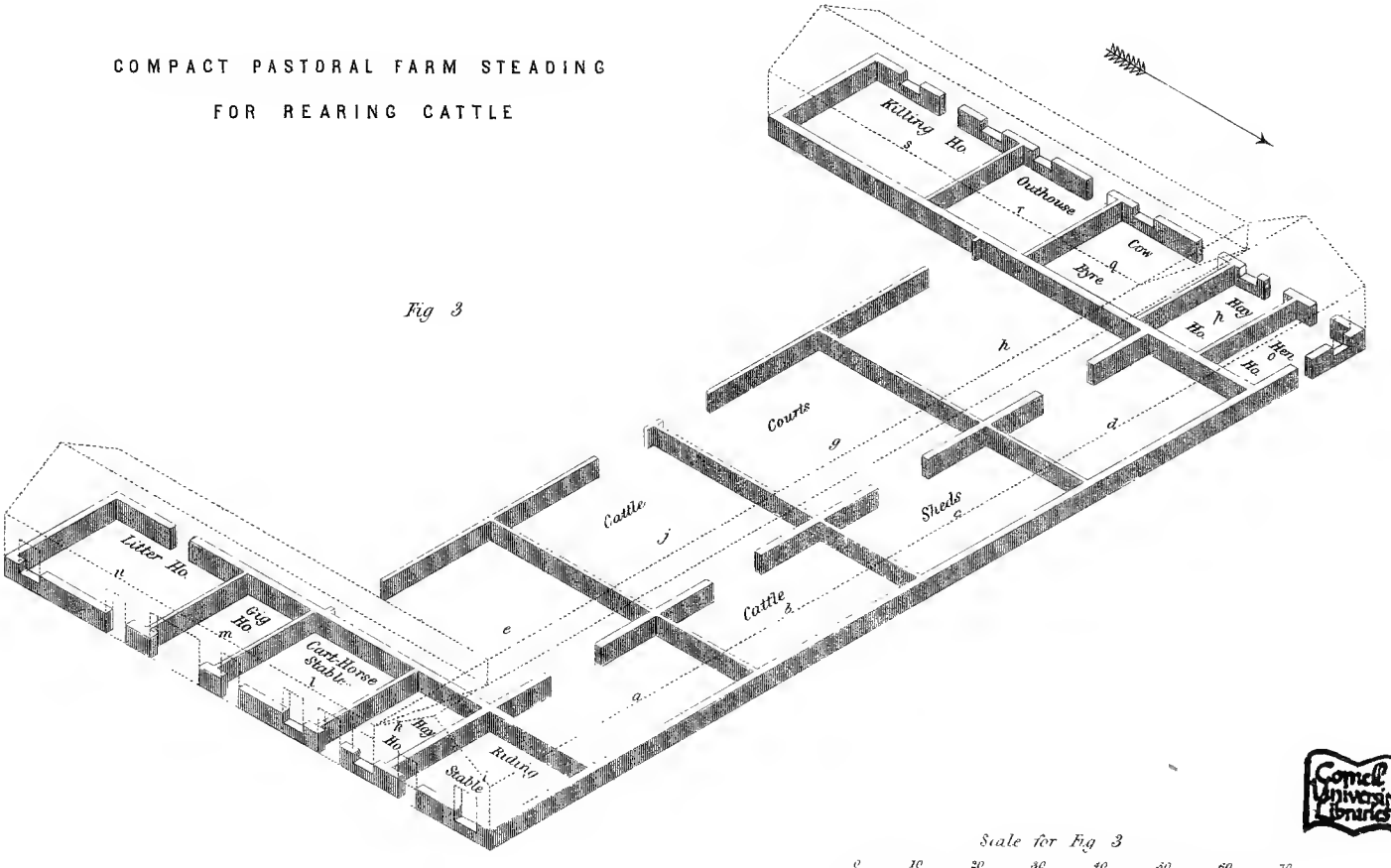
Fig 2

Scale for Figs 1. 2.

0 10 20 30 40 50 60 Ft

COMPACT PASTORAL FARM STEADING
FOR REARING CATTLE

Fig 3



Scale for Fig 3

0 10 20 30 40 50 60 70 Ft

PLATE I

FARM STEADING FOR REARING CATTLE
WITH ARABLE CULTURE

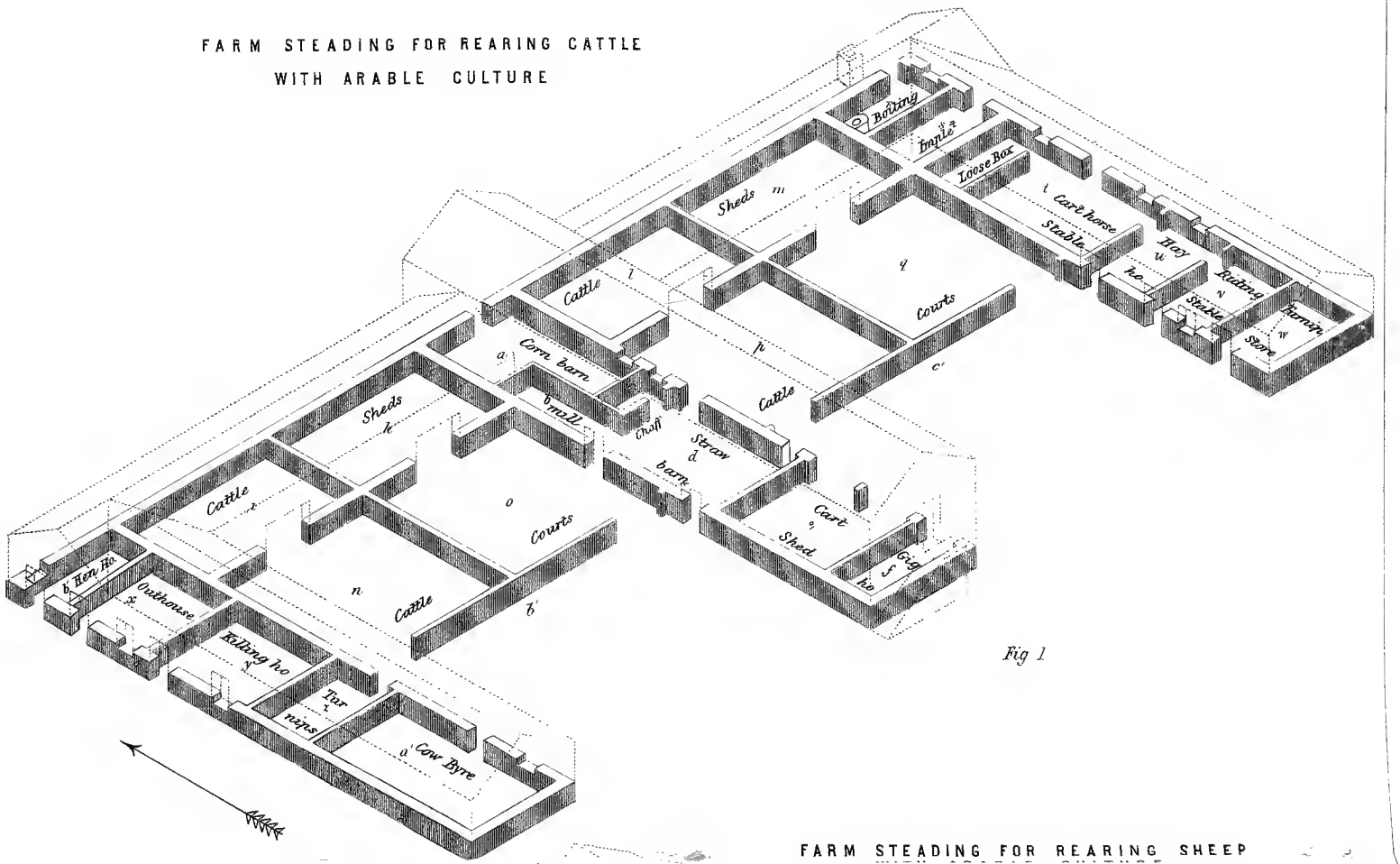


Fig 1

FARM STEADING FOR REARING SHEEP

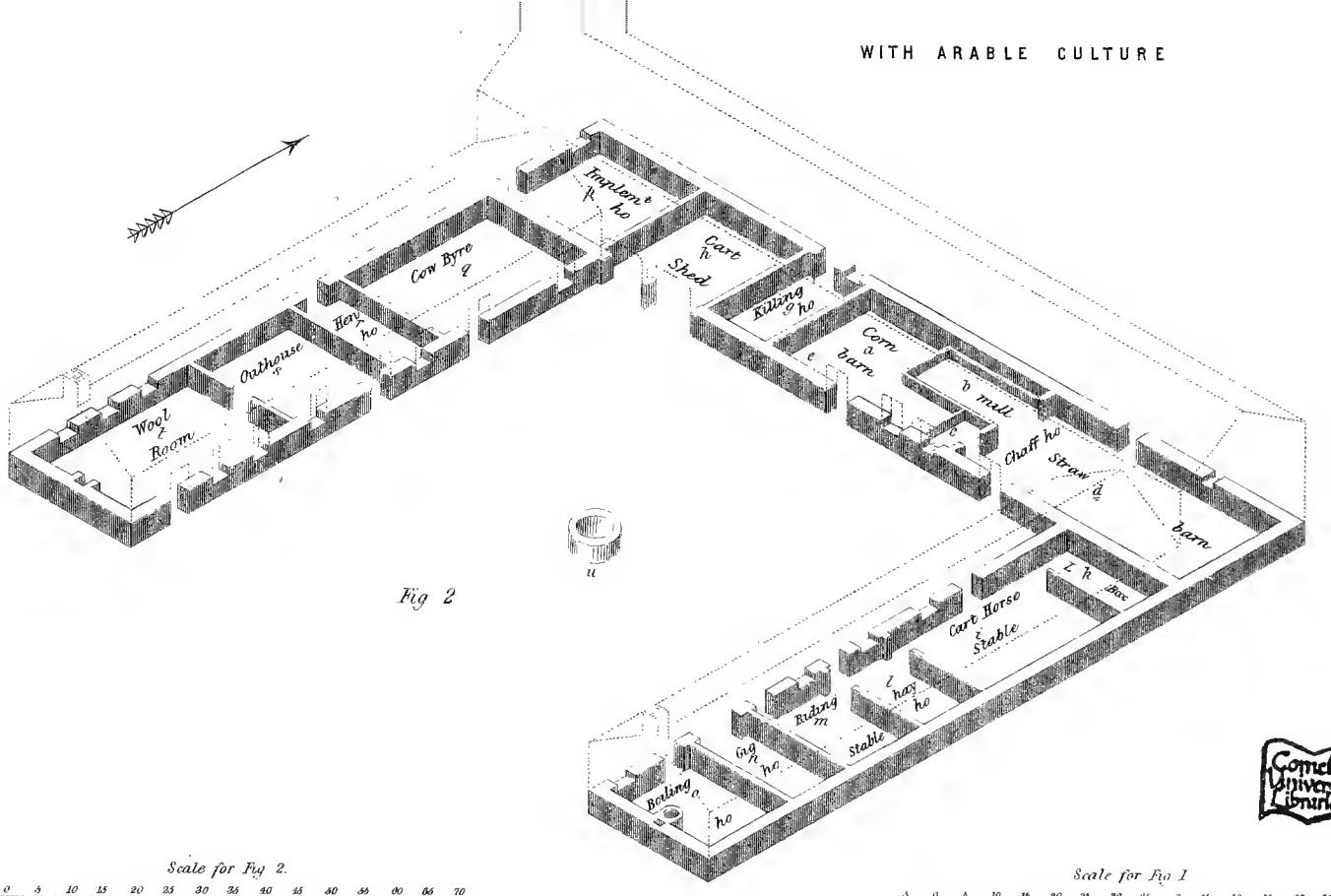


Fig 2

Scale for Fig 2.

5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Feet.

Scale for Fig 1

5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 Feet.

SMALL DAIRY FARM STEADING

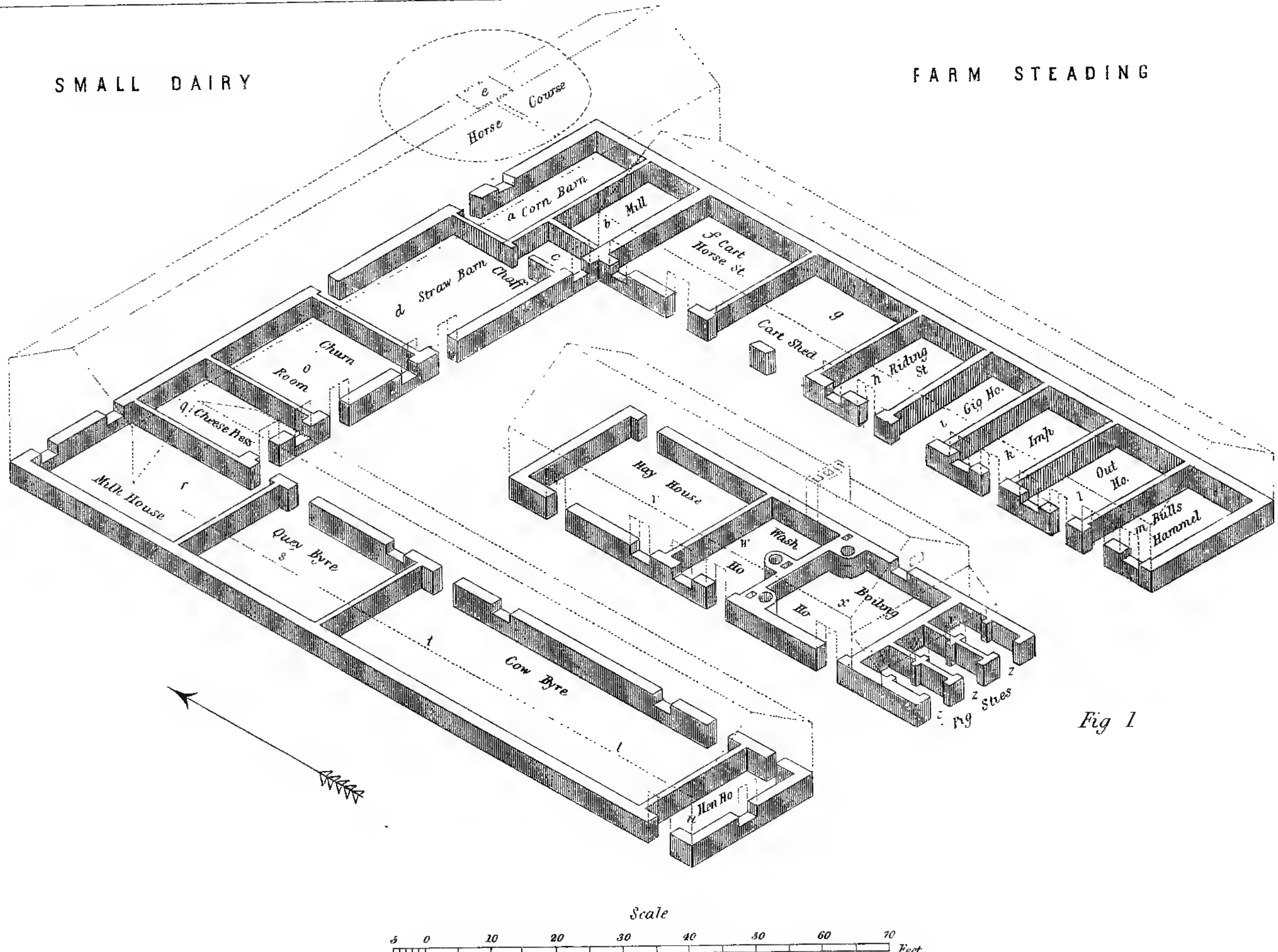


Fig 1

SUBURBIAL
FOR

FARM STEADING
ARABLE CULTURE

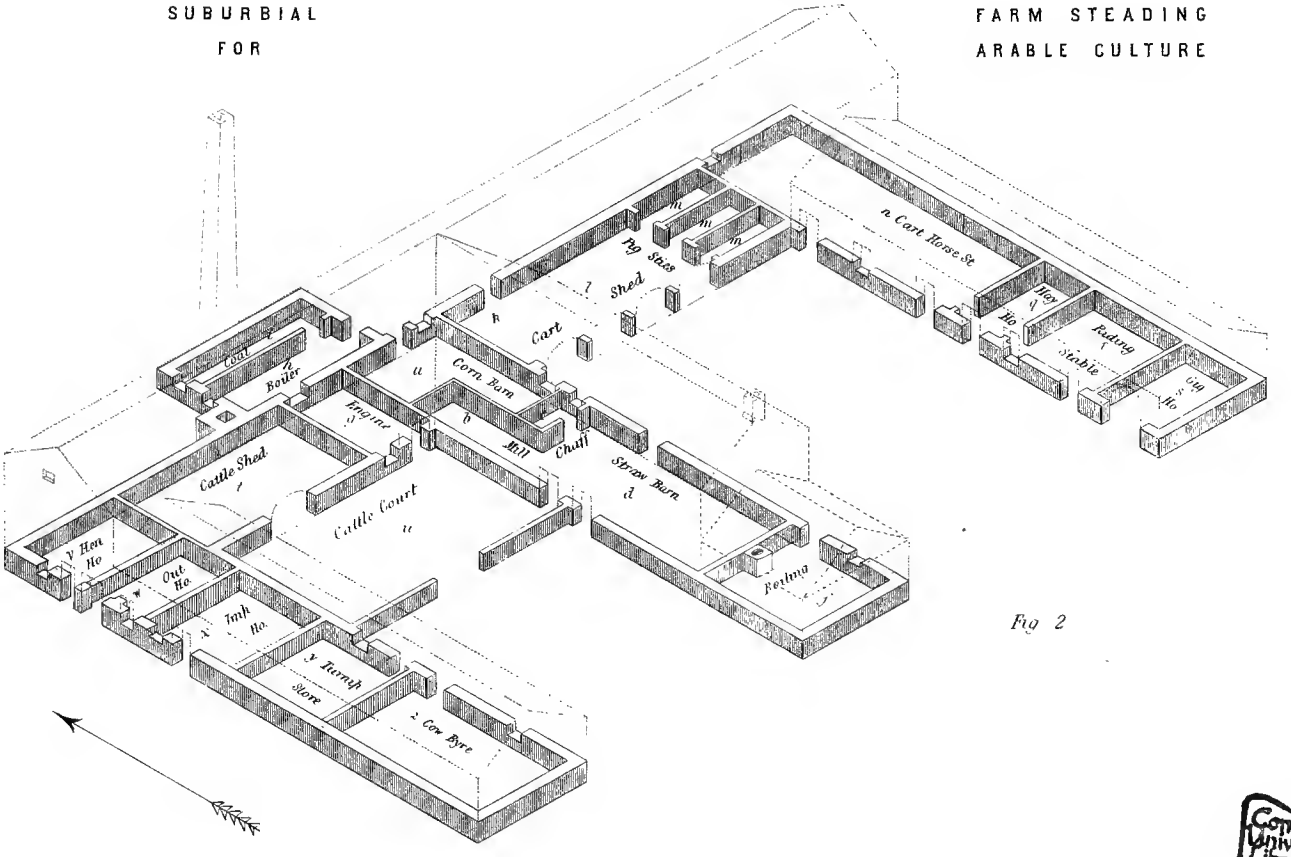


Fig 2

Scale

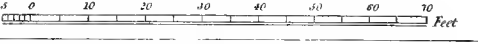
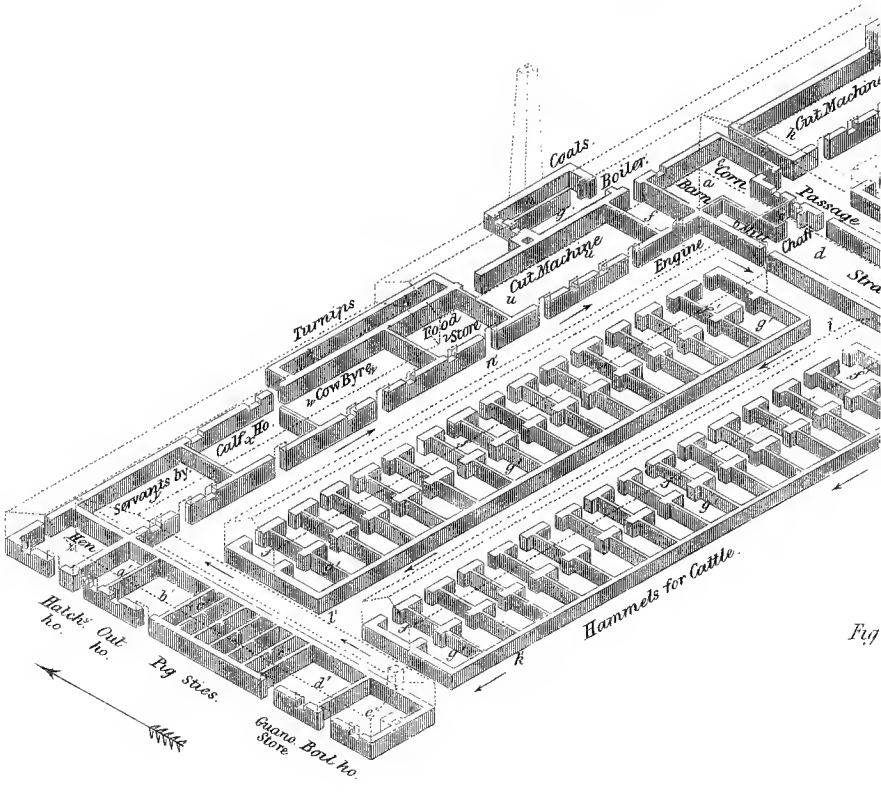


PLATE III

Fig 1



Scale.

0 10 20 30 40 50 60 70 80 90 100

TEADING

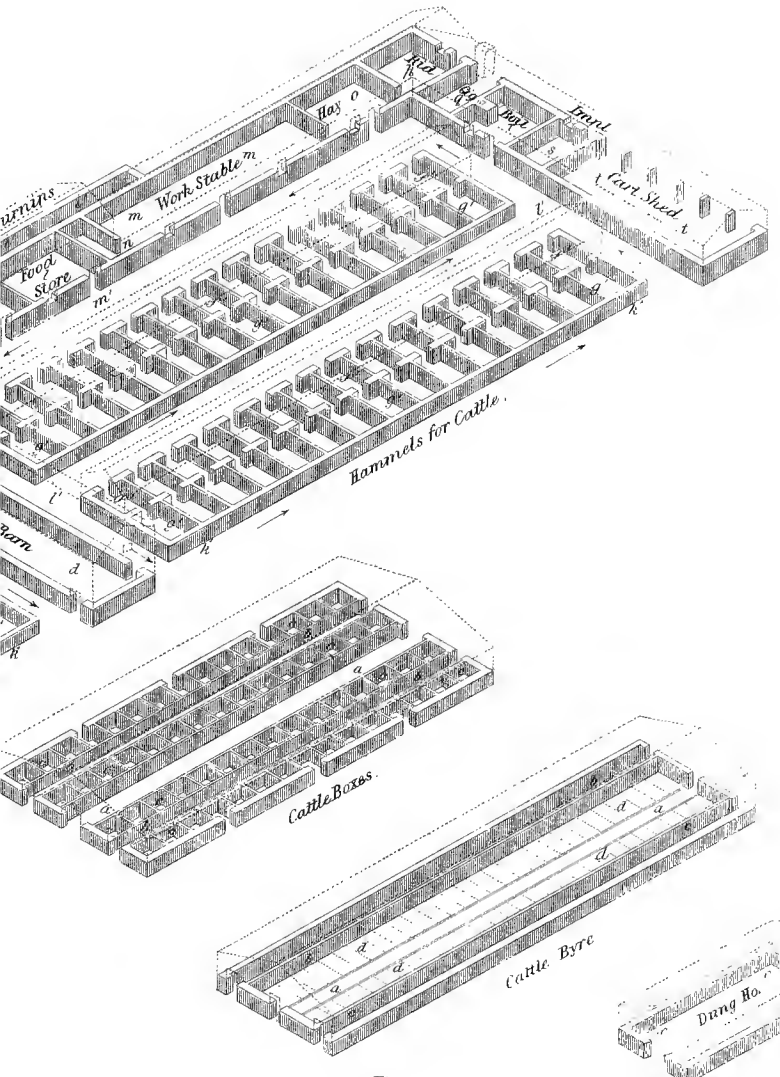


Fig 3

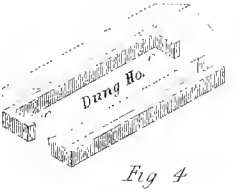
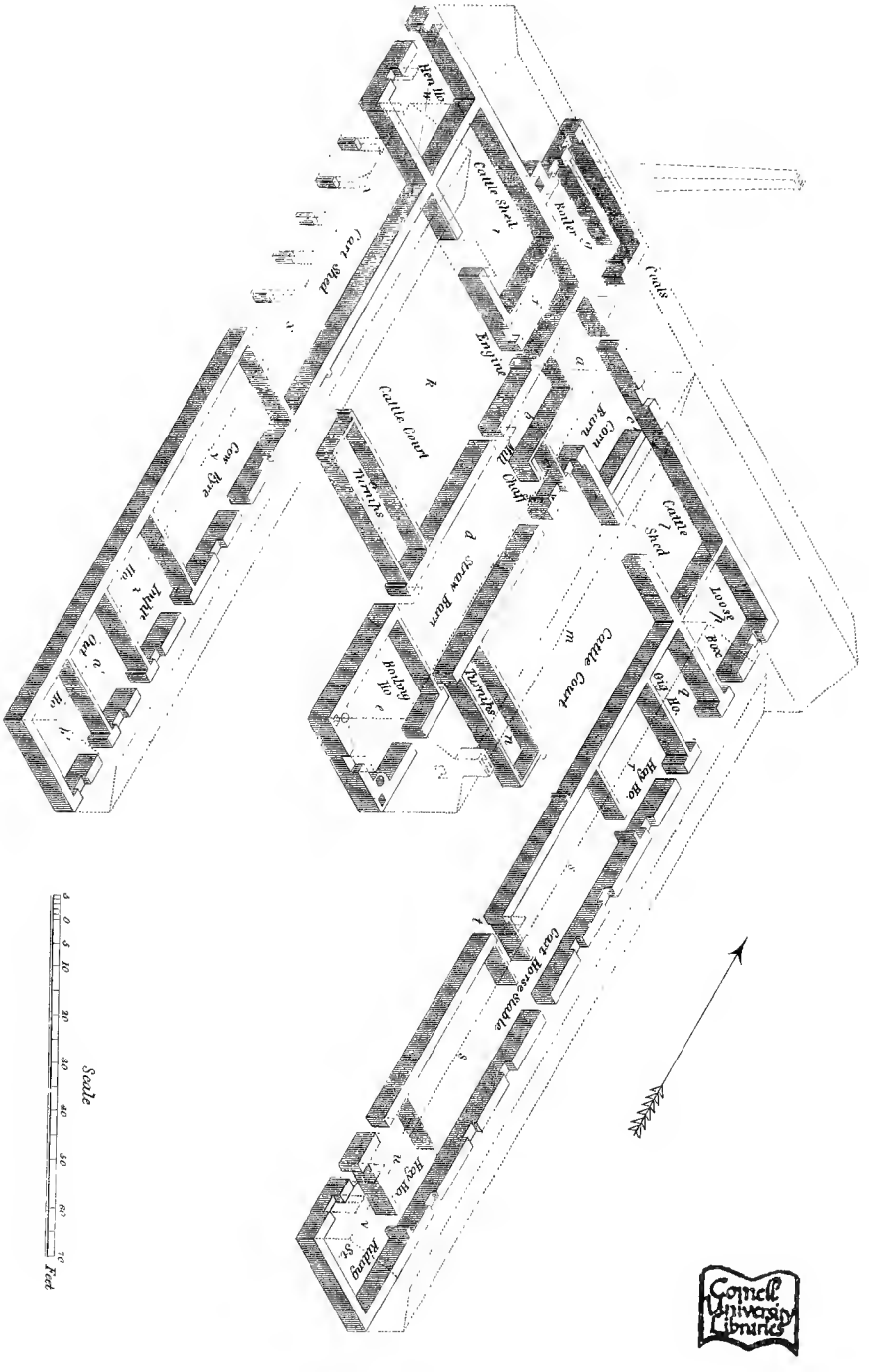


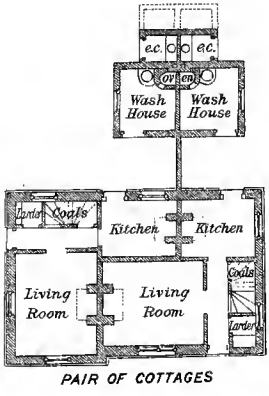
Fig 4

140 160 180 200 Feet

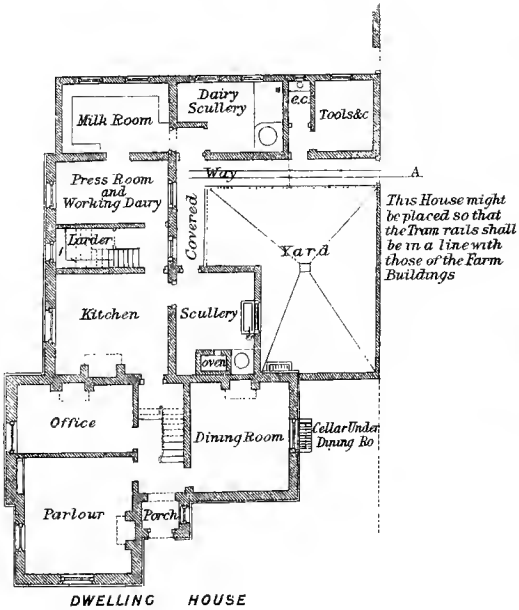
CARSE FARM STEADING



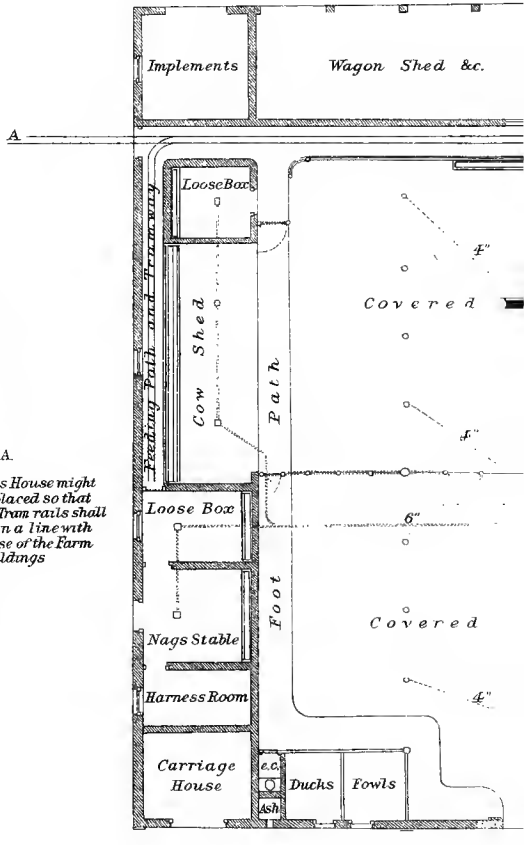
PLAN OF A
DAIRY HOMESTEAD
FOR
EIGHTY COWS
AND FORTY YOUNG CATTLE

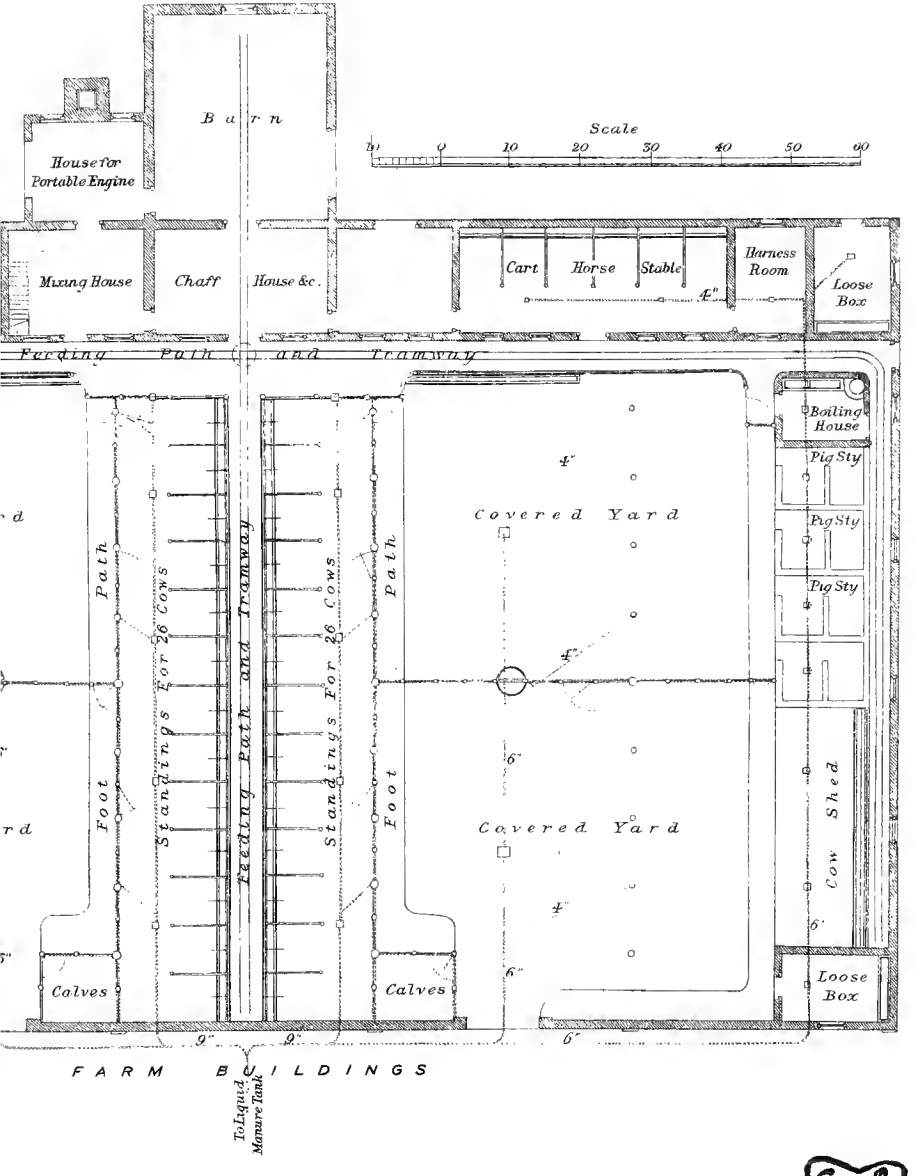


PAIR OF COTTAGES



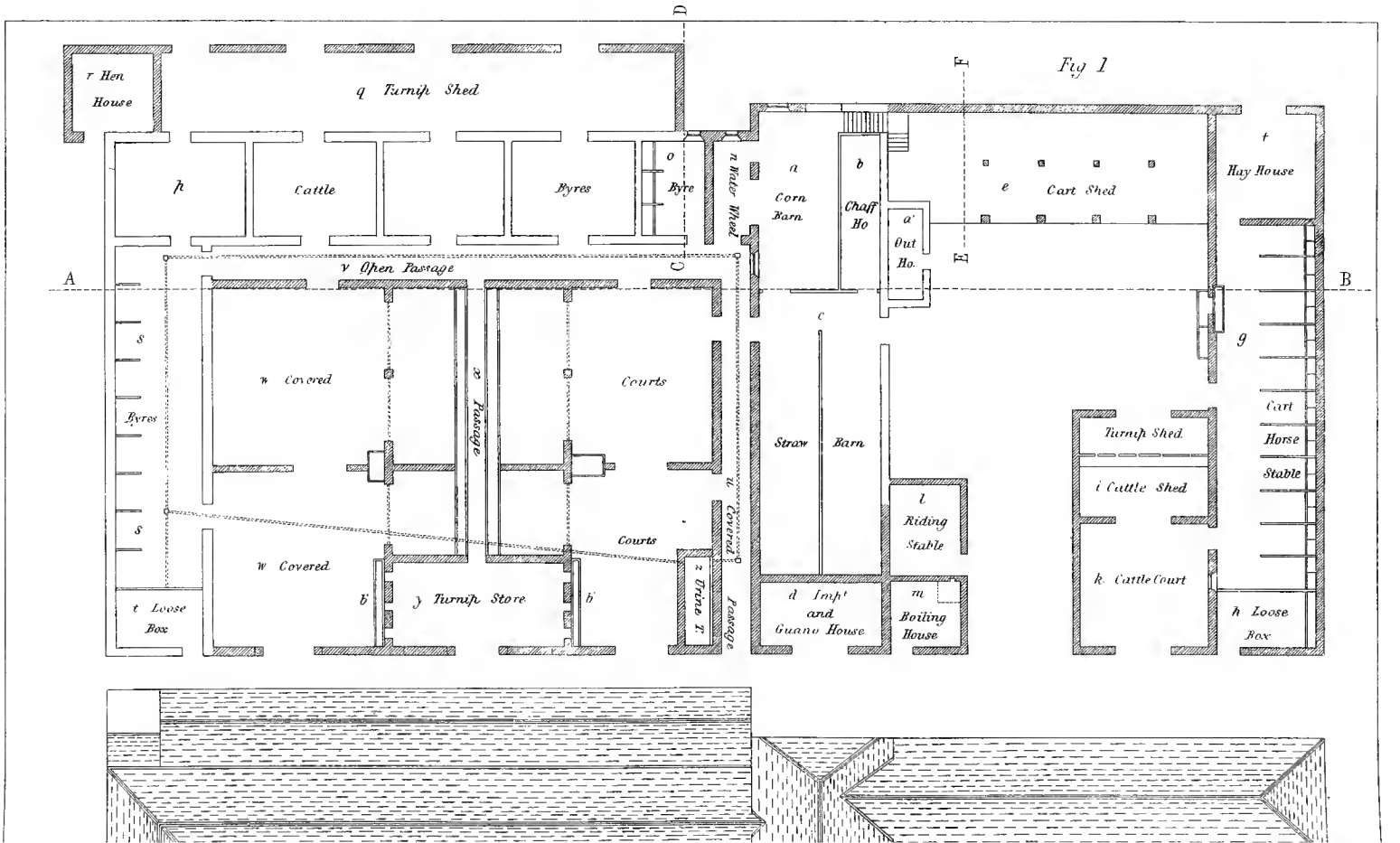
DWELLING HOUSE





FARM STEADING AT INVERQUHARITY

With Alterations and Additions.



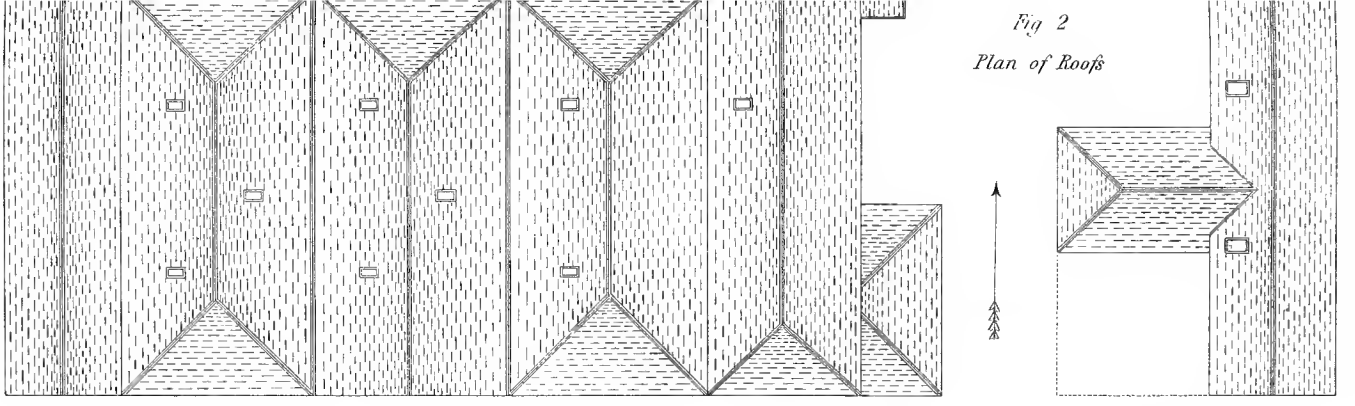


Fig 2

Plan of Roofs

Fig 3

SOUTH ELEVATION

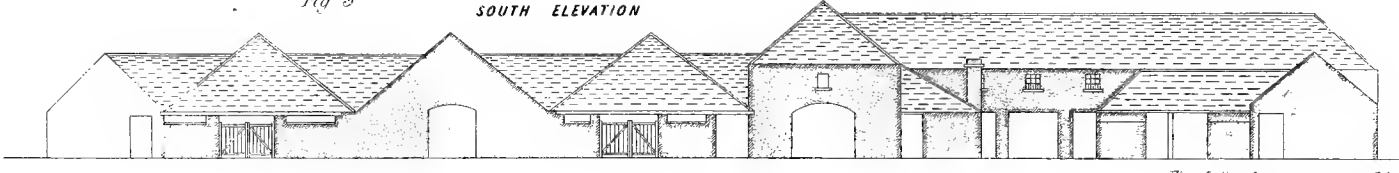


Fig 5 Section on the Line C D

Fig 4. Section on the Line A B.

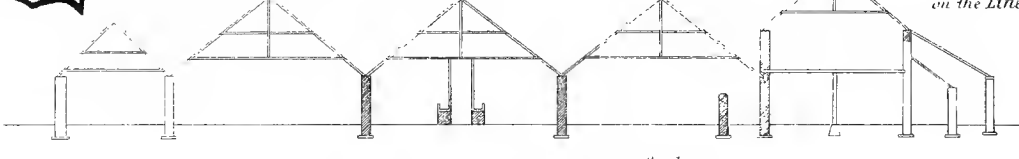
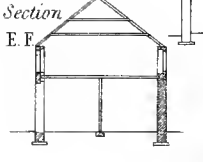
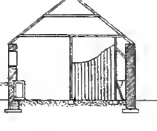


Fig 6 Section on the Line E F.





Scale

PLATE VII

FRONT ELEVATION OF FARM HOUSES

Fig 1

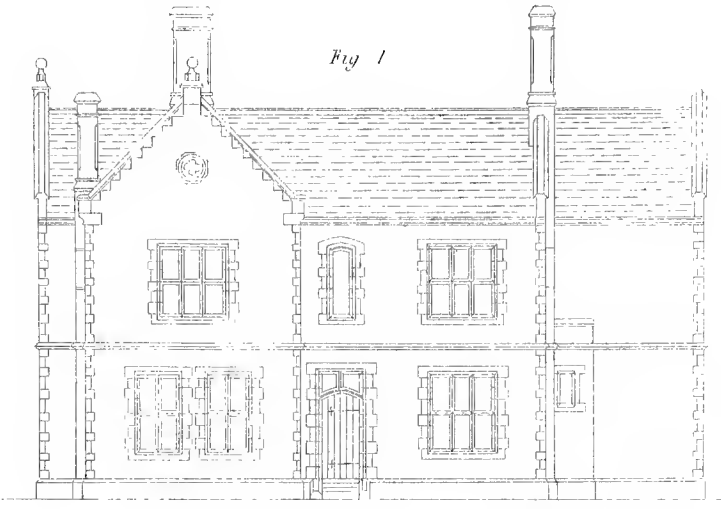


Fig 2

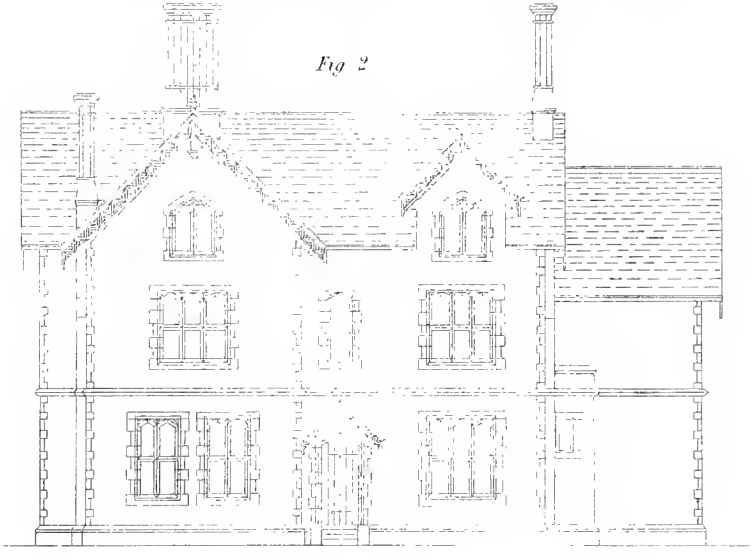


Fig 3

Scale 0 5 10 15 20 25 30 35 40 ft

THE

BOOK OF THE FARM

Wherefore come on, O young husbandman!
Learn the culture proper to each kind.

VIRGIL.

THE

BOOK OF THE FARM

DETAILING THE LABOURS OF THE

FARMER, FARM-STEWARD, PLOUGHMAN, SHEPHERD, HEDGER, FARM-LABOURER, FIELD-WORKER, AND CATTLE-MAN

BY

HENRY STEPHENS, F.R.S.E.

CORRESPONDING MEMBER OF THE NATIONAL AND CENTRAL SOCIETY OF AGRICULTURE OF FRANCE; OF THE AGRICULTURAL SOCIETY OF GALICIA; OF THE AGRICULTURAL INSTITUTE OF GOREGORETZK IN RUSSIA; OF THE ROYAL AGRICULTURAL SOCIETY OF SWEDEN; OF THE ROYAL IMPROVEMENT SOCIETY OF NORWAY

FOURTH EDITION

REVISED, AND IN GREAT PART REWRITTEN, BY

JAMES MACDONALD

OF THE 'FARMING WORLD';

AUTHOR OF 'FOOD FROM THE FAR WEST'; JOINT AUTHOR OF 'POLLED CATTLE,' 'HEREFORD CATTLE,' ETC., ETC.

IN THREE VOLUMES

VOLUME I.

WILLIAM BLACKWOOD AND SONS

EDINBURGH AND LONDON

MDCCCXCI

PREFACE.

MORE than twenty years have elapsed since the third edition of *The Book of the Farm* was prepared. In that comparatively short period of time British agriculture has undergone a striking change. It has seen its highest point in prosperity and almost its lowest in depression. Since the disastrously wet and sunless year of 1879, bad seasons have in themselves swept away a vast amount of farming capital. Foreign countries, with virgin soil and cheap labour, have flooded our open ports with meat and bread-stuffs; and, in spite of a largely increased population and much greater purchasing power on the part of the consuming public, the prices of nearly all varieties of farm produce have greatly declined.

How serious is the influence which these great movements have exercised upon our beloved country cannot readily be conceived. What they have signified to the farming community itself has, alas! been only too clearly visible. How fundamentally the fabric of British agriculture has been affected will be best understood by a consideration of the figures which represent the movements in imports and prices of agricultural produce, as well as the variations in the cropping and stocking of British farms.

The value of the imports of agricultural produce had grown

in 1887 to the formidable figure of £117,019,064, rather more than 48½ millions sterling in excess of the sum sent abroad for these commodities twenty-one years previously. Reckoned per head of population, the imports in 1887 amounted to £3, 3s. 9d. for every man, woman, and child in the United Kingdom, or nearly 18s. 6d. per head more than in 1866. And the growth in quantities has been greater than in the value of the imports by from 25 to 30 per cent.

With such a vastly increased volume of foreign competition as these figures exhibit, the prices of farm produce in British markets could not fail to have suffered decline. The falling off in prices has indeed been very great, and it has extended in less or greater extent to almost every article produced on British farms.

It has been greatest in grain, greatest of all in wheat. From about 50s. per quarter in 1866 wheat fell to 31s. in 1887. In the same period barley lost 11s. and oats 8s. per quarter. Wool has fallen from 1s. 9d. to from 10d. to 1s. per lb.

The prices of beef and mutton have had many "ups" and "downs" since 1866. They are now (May 1891) not much below the level they presented then, but are from 15 to 25 per cent below the high range of prices attained between 1870 and 1883.

In sympathy with these alterations in prices, the systems of cropping and general farm management pursued throughout the United Kingdom have naturally undergone, and are still undergoing, considerable modification.

In the extent of cultivated land—arable land and permanent pasture—there has been a substantial increase in the past twenty years,—no less than 2,870,714 acres in Great Britain. But, as the result of the depression, as many as 833,393 acres have in twenty years gone from regular tillage into permanent pasture.

Looking more narrowly into the division of the arable land amongst the various crops, we find that the twenty years from

1868 to 1887 introduced changes which are even more significant. The corn crops have lost ground considerably, falling from about 52 per cent of the arable land in 1867 to about 48 per cent in 1887. Green crops and grasses have both grown in proportionate extent—the former by about 7 and the latter by 58 acres in every 1000 acres of arable land. But the most notable change occurs in the area of bare fallow, which has fallen off by nearly 50 per cent. In Ireland similar movements have taken place.

In the relative positions of the individual crops in regard to acreage, the past twenty years have effected some significant changes. Amongst cereals, wheat has had to yield the premier position to oats. Barley has been nearly stationary. Beans have declined by nearly 30 per cent. Turnips are losing ground, potatoes gaining a little. The former is still, of course, by far the most extensively grown of the green crops. Mangels have increased by about 50 per cent.

It is thus obvious that corn-growing has lost its supremacy in the agricultural interests of this country. Increased reliance is placed upon live stock; and although this industry has not escaped the vicissitudes of the recent depression, it has nevertheless made substantial progress during the past twenty years. The progress in that period has not been continuous, and it has not extended to all varieties of farm live stock; yet the national wealth in the live stock of the farm is very much greater now than it was prior to 1870.

Between 1867 and 1887 the stock of cattle in Great Britain increased by nearly 1½ million head, and in Ireland by about half a million head. Curiously enough, in the same period the stock of sheep fell off by nearly 3 million head in Great Britain and 1½ million head in Ireland. Somehow pig-rearing, although when well conducted it is notoriously profitable, does not find favour with the majority of British farmers, and their stock of pigs has decreased by more than half a million head in the past twenty years. Irish farmers are more kindly disposed towards the pig, and their stock has increased substantially since 1867.

Despite the prediction that the steam-engine would tend to supplant horse-labour, the demand for draught-horses is now greater than ever. The stock of horses is larger than it was twenty years ago; yet it is undoubted that the breeding of horses might be extended with profitable results.

The important circumstances thus briefly indicated have produced something like a revolution in the position and prospects of the British farmer. He can no longer be the easy independent waiter upon Providence that he used to be when wheat was at 50s. per quarter. His life must be a struggle for existence, and he must prepare himself with a scientific and technical knowledge of his work in all its details and departments; must acquaint himself with the latest ideas of the practical and scientific agriculturist, and test them by his own experience and possibilities; and must cast around him in search of information as to how he can make the most of the altered condition of things. It is by knowledge combined with experience that the farmer of the future must make his way. The State has begun to appreciate this fact by establishing means of providing agricultural instruction. But the practical farmer requires more full and special sources of information,—a work which he can with profit make the subject of general study, and which he can with confidence refer to at any moment when he is in want of advice. Such a work, it is hoped, *The Book of the Farm* in its new and enlarged form will prove to be.

In the preparation of this the Fourth Edition of *The Book of the Farm*, the important changes of the past twenty years have been carefully and anxiously considered. To a large extent the work has been rewritten; what remains of the original text has been carefully revised.

Alike in providing the new matter and in revising the old, the great object aimed at has been to adapt the work to the altered and still shifting circumstances and surroundings of the

British farmer. Without neglecting, or turning our back upon, any of the branches of farming which may perhaps be of comparatively less importance than in former times, we have devoted more attention than was given in previous editions to some other interests which have risen in the scale of importance. Prominent amongst these latter is the great subject of stock-rearing, notably the breeding and feeding of cattle. The portions in the new edition relating to this branch of farming consist almost entirely of fresh matter; and so important is it considered, that it has been dealt with more fully and more exhaustively than has ever before been attempted.

Scientific and practical research have thrown fresh light upon the fundamental processes of maintaining the fertility of the soil. An entirely new chapter places the reader in possession of this extended and corrected experience. The system of ensilage, the latest agricultural innovation, and the extension of dairy farming, have received due attention. Every modification and development of great or minor importance, every new or extended influence affecting agriculture, has had careful consideration. Brief sketches of all the varieties of British horses, cattle, sheep, and swine are enhanced in usefulness by a full series of high-class animal portraits, which embraces typical animals of all the leading breeds, and which has been specially prepared at great expense for this edition by eminent artists. It is interesting to contrast with these the few portraits retained of animals representing the period from 1840 to 1850.

The original plan of the work has been in the main preserved. With the view of facilitating reference, some minor changes, such as headings instead of numbers to paragraphs, have been introduced. Much care has been bestowed upon the introduction of these paragraph headings, and they are set forth clearly, so that the reader may learn at a glance the subjects dealt with in any part of the work.

As in the third edition, the work is divided into heads: 1. INITIATION, in which the young man desirous of becoming a

farmer is advised to acquaint himself beforehand with certain branches of science which have a close relation to Agriculture, and is also instructed as to how this knowledge is to be obtained and as to where he can best learn the practice of his art; 2. PRACTICE, which details the entire operations, through the four seasons, of raising crops, and rearing the domesticated animals; 3. REALISATION, wherein the young farmer is advised how to bargain for and stock a farm—how to execute many operations he may have to undertake—how to judge and to conduct the breeding of live stock—and, lastly, how to keep accurate accounts of all his transactions.

It is hoped that the new edition, in its greatly extended and thoroughly revised form, may efficiently help farmers to pursue their occupation with pleasure and profit. Farming, if it is to maintain its importance as an industry, must, like any other business, be conducted at a profit. With reduced prices and other magnified obstacles, it is more difficult than ever to accomplish this. More than ever, therefore, is it important that the farmer should fortify himself with all the guidance, stimulus, and encouragement which *The Book of the Farm* is capable of affording to him. The work is designed as a guide to him in every piece of practical work and every item of farming business he is called upon to engage in. It presents itself as a faithful compendium of the experience of a whole army of agricultural "specialists,"—men who have shown themselves to be proficient in some special branch of practical farming or province of allied science. The work thus aims at forming in itself a compendious professional library for every well-equipped farmer.

In taking up the life-work of the able and respected author of *The Book of the Farm*, I have felt the responsibility all the greater because of the exceptional conditions which at the present moment surround the British farmer. Happily, in the preparation of the new edition, I have had the privilege of the cordial co-operation of a great many of the leading agricultural and scientific authorities of the day. I have, in particu-

lar, had valuable aid from the following, to whom, and to many other helpers, I heartily acknowledge my indebtedness—viz., Mr Gilbert Murray, Elvaston Castle, Derby; Mr George Brown, Watten Mains, Caithness; Miss E. A. Ormerod; Mr John Speir, Newton Farm, Glasgow; Professor Primrose M'Connell; Professor M'Cracken; Dr A. P. Aitken; Mr Bernard Dyer, F.C.S.; Mr C. M. Aikman, M.A., F.C.S.; Mr R. Warington, F.C.S.; Dr Fream; Professor Thomas Jamieson; Professor R. Wright; Professor Long; Mr John Milne, Inverurie, Aberdeenshire; Ex-Provost Black of Sherifston, Elgin; Mr Charles Whitehead; Mr Martin John Sutton; Mr Robert Bruce; Mr Alexander Macdonald; Mr Thomas Bell; Mr William Morton; Mr John M'Laren; Mr H. Evershed; Mr Edward Brown; Mr Sanders Spencer; Mr R. H. Rew; Mr W. Scarth Dixon; Mr H. F. Euren, &c. &c. I feel that, by the assistance thus accorded to me, I have been enabled to impart to the work a comprehensiveness and efficiency which could not otherwise have been attained. It will be sincerely gratifying to me if the work in its new form should be considered worthy the memory of the late Henry Stephens, whose services to the interests of British farmers have earned for his name a lasting place in the annals of agriculture.

JAMES MACDONALD.

EDINBURGH, 1891.

CONTENTS OF VOLUME I.

INITIATION.

PRACTICE—WINTER.

LIST OF ILLUSTRATIONS IN VOLUME I.

ANIMAL PORTRAITS.

GENERAL ILLUSTRATIONS.

INITIATION.

WINTER.

THE

BOOK OF THE FARM

Wherefore come on, O young husbandman!
Learn the culture proper to each kind.

VIRGIL.

THE

BOOK OF THE FARM

DETAILING THE LABOURS OF THE

FARMER, FARM-STEWARD, PLOUGHMAN, SHEPHERD, HEDGER, FARM-LABOURER, FIELD-WORKER, AND CATTLE-MAN

BY

HENRY STEPHENS, F.R.S.E.

CORRESPONDING MEMBER OF THE NATIONAL AND CENTRAL SOCIETY OF AGRICULTURE OF FRANCE; OF THE AGRICULTURAL SOCIETY OF GALICIA; OF THE AGRICULTURAL INSTITUTE OF GOREGORETZK IN RUSSIA; OF THE ROYAL AGRICULTURAL SOCIETY OF SWEDEN; OF THE ROYAL IMPROVEMENT SOCIETY OF NORWAY

FOURTH EDITION

REVISED, AND IN GREAT PART REWRITTEN, BY

JAMES MACDONALD

OF THE 'FARMING WORLD';

AUTHOR OF 'FOOD FROM THE FAR WEST'; JOINT AUTHOR OF 'POLLED CATTLE,' 'HEREFORD CATTLE,' ETC., ETC.

IN THREE VOLUMES

VOLUME II.

WILLIAM BLACKWOOD AND SONS

EDINBURGH AND LONDON

MDCCCXCI

CONTENTS OF VOLUME II.

PRACTICE—SPRING.

PRACTICE—SUMMER.

LIST OF ILLUSTRATIONS IN VOLUME II.

ANIMAL PORTRAITS.

GENERAL ILLUSTRATIONS.

SPRING.

SUMMER.

THE

BOOK OF THE FARM

Wherefore come on, O young husbandman!
Learn the culture proper to each kind.

VIRGIL.

THE

BOOK OF THE FARM

DETAILING THE LABOURS OF THE

FARMER, FARM-STEWARD, PLOUGHMAN, SHEPHERD, HEDGER, FARM-LABOURER, FIELD-WORKER, AND CATTLE-MAN

BY

HENRY STEPHENS, F.R.S.E.

CORRESPONDING MEMBER OF THE NATIONAL AND CENTRAL SOCIETY OF AGRICULTURE OF FRANCE; OF THE AGRICULTURAL SOCIETY OF GALICIA; OF THE AGRICULTURAL INSTITUTE OF GOREGORETZK IN RUSSIA; OF THE ROYAL AGRICULTURAL SOCIETY OF SWEDEN; OF THE ROYAL IMPROVEMENT SOCIETY OF NORWAY

FOURTH EDITION

REVISED, AND IN GREAT PART REWRITTEN, BY

JAMES MACDONALD

OF THE 'FARMING WORLD';

AUTHOR OF 'FOOD FROM THE FAR WEST'; JOINT AUTHOR OF 'POLLED CATTLE,' 'HEREFORD CATTLE,' ETC., ETC.

IN THREE VOLUMES

VOLUME III.

WILLIAM BLACKWOOD AND SONS
EDINBURGH AND LONDON
MDCCCXCI

CONTENTS OF VOLUME III.

PRACTICE—SUMMER (*continued*).

PRACTICE—AUTUMN.

LIST OF ILLUSTRATIONS IN VOLUME III.

ANIMAL PORTRAITS.

FARM BUILDINGS.

GENERAL ILLUSTRATIONS.

SUMMER—*continued.*

AUTUMN.