

LIVE STOCK OF THE FARM

BY MANY SPECIALISTS
UNDER THE EDITORSHIP OF
PROFESSOR C. BRYNER JONES

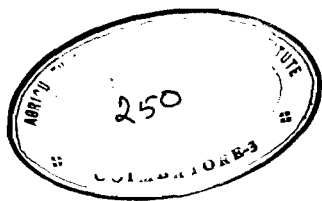
M.Sc., F.H.A.S.

Agricultural Commissioner for Wales under
the Board of Agriculture and Fisheries and
Chairman of the Welsh Agricultural Council



VOLUME VI
BEES: GOATS: DOGS
FERRETS: ASSES AND MULES

THE GRESHAM PUBLISHING COMPANY LTD.
66 Chandos Street, Covent Garden, London



CONTENTS

VOLUME VI

CHAPTER I

BEEES AND THEIR MANAGEMENT

By W. HERROD-HEMPSALL, F.E.S.

Situation and Surroundings—Appliances and Cost—Marketing—Extracted Honey—The Constituents of the Bee Community—Workers—Drones—Life-history of the Bee—Swarms, Natural and Artificial—The Hive—Manipulation of Bees—Feeding of Bees—Recipe for making Candy—Winter Management—Honey—Propolis—Pollen—Bees-wax.	
DISEASES OF BEES: Bee Paralysis—Chilled Brood—Dysentery—Foul Brood or Bee Pest—Isle of Wight Disease—May Pest.	
ENEMIES OF BEES: Ants—Birds— <i>Braula Cœca</i> —Earwigs—Hedgehogs—Mice—Slugs and Snails—Spiders—Toads—Wasps—Wax Moth	Pi 1

CHAPTER II

GOATS AND THEIR MANAGEMENT

By H. S. HOLMES-PEGLER

Breeds of Goats—The English Goat—The Anglo-Nubian—Swiss Goats—Cross-bred Goats—Selection of a Breed—Conditions suitable for Goat-keeping—The Goat House—Goat Stalls—Advantage of Commons—Loose Boxes and Stables—Feeding and Care of Goats—Garden Produce as Food—Dry Food—Rations—Pasturage and Tethering—Water and Salt—Cost of Feeding a Goat—Grooming and Hoof Paring—Breeding—Choice of the Stud Goat—Age for Mating—Treatment of Goats Kidding—Rearing Kids—Hermaphrodite Kids—Milking a Goat—Maiden Goats in Milk—Goat's Milk	
--	--

	Page
and its Uses—Yields of Milk—Goat's Milk and Tuberculosis—Profit and Loss of Goat-keeping—Goat Shows and Exhibiting—Hints to Show Secretaries and Stewards—Hints to Exhibitors—Milking Com- ^o petitions—Dual-purpose Prizes	65

CHAPTER III

DOGS AND THEIR MANAGEMENT

By EDWARD C. ASH, M.R.A.C.

INTRODUCTION—Origin of the Dog—The Dog in Historical Times—The Dog in Agriculture. BREEDS OF DOGS: Beagles and Harriers—Bulldogs—Collies—Dalmatians—Foxhounds—Great Danes—Greyhounds—Mastiffs—Newfoundlands—Old English Sheep Dogs—Pointers—Retrievers—Setters—Spaniels—Terriers—Whippets. BREEDING AND MANAGEMENT: Kennels—Bedding—Exercise—Foods and Feeding—Dog Breeding—Rearing of Puppies—Care in Mating—Training. DISEASES OF DOGS: Abscess—Amaurosis, or Glassy Eyes—Anæmia, or Poorness of Blood—Anus Prolapsed—Apoplexy, Fits—Asthma—Biliousness—Bites—Blain—Blotch—Inflammation of Bowels—Bronchitis—Canker of the Ear—Choking—Colic—Constipation—Diarrhœa—Distemper—Dyspepsia (Indigestion)—Eczema—Feet Sore—Mange—Milk, or Puerperal Fever—Poisons—Rabies—Rheumatism—Rickets—Ringworm—Worms—Wounds, Bites, &c.	101
--	-----

CHAPTER IV

FERRETS AND THEIR MANAGEMENT

By EDWARD C. ASH, M.R.A.C.

Varieties—Accommodation—Feeding—Breeding—Training—Working—Lining a Ferret—Hints in Working Ferrets. DISEASES: Distemper—Foot-rot—Mange, or Scab—Overgrown Nails—Scratching—Worms—Wounds	157
---	-----

CHAPTER V

ASSES AND MULES

By PROFESSOR JAMES WILSON, M.A., B.Sc.

ASSES: Historical—Darwinian Theory—Kinds of Asses—Their Qualities. MULES: Breeding	171
INDEX	177

LIST OF PLATES

VOLUME VI

	Page
THOMAS WILLIAM COKE, EARL OF LEICESTER - <i>Frontispiece</i>	
OPENING A HIVE TO EXAMINE THE COMBS - - - - -	16
EXAMINING THE COMBS - - - - -	33
USING THE HONEY EXTRACTOR FOR SEPARATING THE HONEY FROM THE WAX CELLS - - - - -	33
PICKING OUT THE QUEEN BEE - - - - -	48
A HANDFUL OF BEES - - - - -	48
ANGLO-NUBIAN GOATS—"Shamrock of Castlemilk" and "Riding Rosanne", with Kid - - - - -	72
MILKING GOAT—"Cowslip III". ANGLO-NUBIAN GOAT—"Wig- more Topsy" - - - - -	80
BEAGLE—"Forester" - - - - -	100
HARRIER—"Boaster" - - - - -	100
BULLDOG—"Rodney Stone" - - - - -	101
BULLDOG—"Chepstow Sykes" - - - - -	101
COLLIE—"Woodmansterne Sylvia" - - - - -	108
OLD ENGLISH SHEEPDOG—"Brentwood Bob" - - - - -	108
FOXHOUND—"Primate" - - - - -	109
GREYHOUND—"Broadwater Bender" - - - - -	109
GREAT DANE—"Vrelst of Redgrave" - - - - -	112
MASTIFF—"British Monarch" - - - - -	112
NEWFOUNDLAND—"Ch. Gipsy Baron" - - - - -	113
DALMATIAN—"Partner" - - - - -	113
POINTER—"Rumney Ruth" - - - - -	128

	Page
SETTER—"Rose of Gerwn" - - - - -	128
RETRIEVER (Curly)—"Belle Vue Surprise" - - - - -	129
RETRIEVER (Smooth)—"Jimmy of Riverside" - - - - -	129
CLUMBER SPANIEL - - - - -	132
AIREDALE TERRIER—"Tintern Royalist" - - - - -	132
ABERDEEN TERRIER - - - - -	133
IRISH TERRIER—"Champion Proverb" - - - - -	133
WIRE-HAIRED FOX TERRIER—"Gipsy Moth" - - - - -	140
SMOOTH-COATED FOX TERRIER—"Yeovil Star" - - - - -	140
DANDIE DINMONT TERRIER - - - - -	141
WEST HIGHLAND TERRIER—"Runag" - - - - -	141
BULL TERRIER—"Krishna" - - - - -	152
WHIPPETS - - - - -	152
MULES AT WORK IN LONDON - - - - -	172

LIVE STOCK OF THE FARM

VOLUME VI

CHAPTER I

BEEES AND THEIR MANAGEMENT

By W. HERROD-HEMPSALL, F.E.S.

SITUATION AND SURROUNDINGS

The site for the apiary, by which we mean the place where the bees are kept, should be carefully selected. As a rule it is the least considered part of bee-keeping. It is not unusual to find the beehives relegated to some obscure, dark, damp portion of the garden, which is infested with insect pests. This is most injurious to creatures that love warmth and sunshine, and to whom damp is one of the greatest enemies. While warmth is good for bees it is possible for them to get too hot. For instance, in a walled-in garden, a site in front of, and close to, a wall facing south, where the heat is reflected back, will mean endless trouble, as in such a position it is next to impossible to prevent swarming. It is also possible for the temperature of the hive to be raised to such an extent that the combs become so soft that they fall on to the floor board, and the bees perish by drowning in the honey.

The position chosen should be where there is plenty of ventilation, light and shade; a well-pruned orchard of standard fruit trees is an admirable place for the bees. Here shade is provided, and yet plenty of light is obtained. The fruit trees benefit by the bees being able to get out in brief bursts of sunshine in the early spring, to fertilize the blossoms. If in the garden, the hives should not be placed so that they face a path, or passing individuals will be stung. It is the outgoing bees which sting, as they are empty; those coming

home being full of food are not at all likely to be pugnacious. If the hives must be placed in close proximity to a path, then for protection a break of some kind should be grown about 6 ft. high and 4 ft. in front of the hives. In the kitchen garden scarlet-runner beans or artichokes will do, in the flower garden a wire screen with some creeping flowering plant or sunflowers should be grown. This compels the bees to fly up and out of the way of anyone passing. To avoid loss by damage by stings to third parties, either animals or human beings, it is well to insure with the British Beekeepers' Association, who issue a policy for this purpose to cover loss up to £30, at 1*d.* per hive, with a minimum of 9*d.*

The entrance to the hive should face south-east, as in this position sunshine is obtained more suitably than in any other. The hives must not be placed on a hill, otherwise many bees will be lost in the early spring when returning to their home, by being dashed to the ground by the cold boisterous winds. It is inadvisable to place the hives near a running stream for the same reason, and also that many will be drowned in attempting to obtain water, which is so necessary in the early spring.

It must be obvious to anyone that bees should not be kept where cattle can get close to the hives, especially horses, to the smell of which bees seem to have a strong antipathy. If placed in a field they should be fenced with barbed wire, at least 20 ft. away. It is also inadvisable to keep them where poultry can get near the hives.

The next matter to consider is the forage obtainable in the district. The number of stocks kept must be regulated according to the acreage of the flora within a radius of 4 miles, as the bee flies 2 miles in a straight line to gather nectar. The chief flowers upon which the bee-keeper depends for surplus in this country are: Fruit Blossom, Sycamore, Sainfoin, White Clover, Alsike Clover, Red Clover (second crop), Mustard, Charlock, Lime Trees, and Heather. There are, of course, many other flowers which are useful to the bees, but do not count when surplus is concerned. For instance, in the early part of the year, Winter Aconite, Borage, White Arabis, and Wallflower give a splendid stimulus to the bees, supplying food for the early brood in the hive, while Crocus, Willow catkin, and other flowers supply them with abundance of nitrogenous food in the shape of pollen.

There are very few districts in Great Britain where a few

stocks of bees will not thrive and give profit to their owner, while in many counties and districts almost an unlimited number might be kept. A fact worth remembering is, that the bee is one of the farmer's greatest friends. This is not generally realized, as it works so quietly, yet without its aid it would be impossible to obtain a tithe of the seed required from field crops, such as White Clover, Sainfoin, Turnips, Mustard, &c. To fruit farmers the bee is indispensable, without it his crops would be a complete failure.

Even in the suburbs of large towns bees often do remarkably well. It is contended by some that the extensive cultivation of the land denudes it of the wild flowers upon which bees work, therefore in arable districts they are less likely to thrive than where there are wide stretches of grass and meadowland. The fallacy of this can be seen by reference to the list of bee flowers already given. By the cultivation of such crops as White Clover, Sainfoin, Mustard, &c., the foraging ground for the bee is more extensive in an arable district than anywhere else. Even that farmers' bane, Charlock, which grows as a weed on arable land, will often provide surplus in the hives.

The hives should not be placed too close together, if possible a space of at least 12 ft. should separate them. If placed too close together, which is often the case, there is great danger of inducing robbing when manipulating. If disease breaks out it is difficult to deal with, or isolate the stocks, and also if one stock commences to swarm, what is termed the swarming fever will very likely spread to the others. This means that the noise and excitement of swarming is contagious, so that instead of having one swarm only, the majority of the stocks will throw off swarms, although they have made no previous preparation for doing so. If the amount of ground is limited, so that they cannot be stood in line, then the hives should be arranged on the quincunx principle. This allows of clear flight for each lot of bees, and also enables the bee-keeper to keep clear from the line of flight when manipulating.

It is much better to have hives with legs, as this makes them independent of each other, and gives greater comfort in working for such operations as artificial swarming, making nuclei, &c. It also allows for the arrangement of the hives in any position. If hives without legs are used, then it is necessary to have either a long stand and arrange them side by side on this, or they must be placed upon bricks, which brings the entrance near the ground, so that the bees are an easy prey for various enemies. In such a

position, also, the hives are far too damp. The legs of the long stand or hive should be about 9 in. long, so that the entrance will be about 1 ft. from the ground. For the preservation of the legs it is well to stand them on bricks. Some bee-keepers make a concrete or asphalt square to stand them upon. This is very useful, as it does away with the necessity of using bricks, and also keeps the hive clear of grass or weeds, so that it is quite easy to examine the ground at the front of the entrance for dead bees or queens if there is a suspicion that all is not well with the bees. If the queen should be dropped during manipulation it is an easy matter to find her, which is not the case if grass is allowed to grow. Another method is to put down sawdust about 6 in. deep, and water this from time to time with weed-killer and also a disinfectant.

The hive should be set so that it is level from side to side, and a slight slope of about $\frac{1}{4}$ in. to the front, so that the moisture which condenses inside will drain away. During the summertime an extended alighting board reaching right to the ground should be used. This enables those bees which, through being heavily laden, miss the alighting board and fall to the ground (but which, though they are incapable of rising on the wing again, are able to walk), to crawl back into the hive up this board. By its use many valuable lives are saved.

There is an impression by some that it is necessary to have a house in which to keep the bees. This is a great mistake. As already pointed out, it is much the best to have the hives independent of each other, and some considerable distance apart. The advantages of a bee-house are that manipulation can be carried out in any kind of weather, and the operator is free from the flying bees. These are far outweighed by the same faults possessed by the long stand, and also by the cramped position in which the bee-keeper has to work. There is also the expense of building such a house to be taken into consideration.

The hives should not be placed too near human habitations, or yet near the highway, or public footpaths. To give some idea of distance they should be about 50 ft. away from either, otherwise trouble may arise from the fact that the majority of human beings seem to imagine that when a bee comes near them its one desire is to sting. They therefore commence to strike at it, with dire results. For not only does the one bee attack them, but their frantic movements in fighting the one will quickly attract others from the hives.

The result is not only trouble to themselves but to any human being or animals near.

It is also well to avoid putting the bees in the vicinity of lawns, where a mower is used, as the rattle of the machine provokes them and causes them to sting.

Where bees are kept on the farm it is well to know that the noise of a grass mower, and the movable arms of self-binders or reapers, is annoying to them; this, with their antipathy to the smell of perspiring horses, has in several cases led to disaster. All crops near the bees should be mown either very early in the morning or late at night, and even then greater safety is ensured by sponging the horses down with a weak solution of carbolic acid before commencing work. If the bees do attack the horses it is of no use trying to fight them. Liberate the horses as quickly as possible, and they will find safety themselves in flight. Fifty yards is a safe distance at which to work.

On large ordinary farms, or where fruit is the chief crop grown, it is advisable to place the bees in different parts, so that they may be quite close to the crops grown. In a summer of intermittent rain and short spells of sunshine they will be able to get out and work upon the flowers close to the hive, so obtaining surplus honey as well as fertilizing the flowers, and giving a seed or fruit crop which would otherwise be a failure.

APPLIANCES AND COST

The appliances for apiculture should be as simple as possible. Complications are a nuisance to the uninitiated, and the experienced person will not have them. There are a great many different patterns of hives, and it is difficult for the beginner to decide upon the kind to use. Often he seeks information from those whom, because he is aware that they possess a few stocks, he imagines know all about bees and bee-keeping. Not satisfied with the advice of one person, he obtains the ideas of several more, only to find eventually that in a multitude of counsellors there is not always wisdom, for each one has his own pet hive. There are two patterns of hive from which he should make his choice, either a double-walled one called the W.B.C. after its designer, the late William Broughton Carr, or a good pattern single-walled one.

In making the choice it is of course necessary to consider one's financial position, and although the W.B.C. hive is undoubtedly the

best form to use it is slightly the dearest, though the extra few shillings spent in buying this in preference to the others is money well invested. Later on a full description of both hives, together with illustrations, are given.

It is a mistake to have a number of different kinds of hive in the apiary. For successful management it is necessary to have all the parts of the hives interchangeable, and to this end the bee-keeper should stick to the one which he first adopts.

A great saving in expense can be made if hives and appliances are made by the bee-keeper himself instead of purchasing. This is interesting and profitable work for the long winter evenings. The best way to proceed is to purchase a hive as a working model. For those who can work to scale drawings, there are several good ones printed. It is not necessary to buy expensive wood, as, with a little ingenuity, boxes and packing cases, which can be purchased very cheaply, can be utilized. The part which gives the most trouble is, to make a water-tight roof. This can be accomplished by covering with stout calico or canvas, which is then well painted, making it perfectly waterproof. The hive will cost from 10s. 6d. to 25s. according to the pattern chosen.

There are various other appliances which are necessary, the uses of which will be described later, the price and form with a few exceptions being given here.

A veil will be required, which should be made of material that will obstruct the view as little as possible. Black silk net is the best but is too expensive, therefore if white mosquito netting is bought and made into a veil of ample proportions, with a square of black net to come in front of the face, it will be found effective and cool to wear, or an all-black mosquito net can be used. It is necessary to have an elastic band in the top to go tightly round the hat, and one in the bottom to go round the coat collar, so that it fits tight to keep out crawling bees.

The white veil can be purchased ready-made for 1s. 6d., and the all-black for 1s. Avoid wire veils, as they are cumbersome, and also those of other colours than those given, as they are difficult to see through.

Gloves should not be worn except in rare instances, i.e. if the stings affect the person very badly. The fingers are not supple when muffled in gloves, and this causes clumsy manipulation, which irritates the bees and causes them to sting. The best gloves to use are thin rubber ones, as these allow a more delicate touch

than any other form. Care should be taken to rub the hands well with french chalk before putting them on, otherwise perspiration will cause them to stick and peel the skin from the hands. Rubber gloves cost 2s. 6d. to 10s. 6d. per pair, and soft leather ones, specially made for bee-keepers, with gauntlets, cost 3s. 3d. per pair.

A pair of gauntlets are a comfort, as they keep bees from going up the sleeves. These cost 9d. per pair.

A smoker is necessary, and the best form to use is the Bingham. This varies in price from 2s. 3d. to 4s. according to size. Avoid the so-called humane "Clark's Cold Blast", as there is no direct draught through the cartridge, and it is difficult to keep the fuel burning properly.

Two extra section racks or shal-

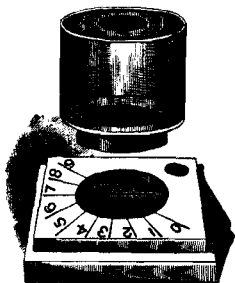


Fig. 1

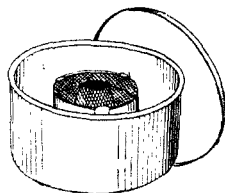


Fig. 2

low frame supers will be required for each hive. These filled complete cost 3s. each.

A graduated bottle feeder for stimulating bees (fig. 1) will also be required, as well as a rapid feeder (fig. 2). The former costs 1s. 3d. to 1s. 9d., the latter 1s. 3d. to 3s.; for the latter price an aluminium one can be purchased. These save a great deal of trouble as they do not rust, which is the case with tin ones.

A supply of sections will also be required, and it is best to purchase those in the original cases of five hundred, which cost 13s. 6d., or they can be purchased at 3s. per hundred.

Extra brood frames should also be secured, which cost 1s. 3d. per dozen or 7s. 9d. per hundred. Metal ends for same cost 1s. 9d. per gross. A supply of foundation should always be kept on hand. This varies in price each year, but averages about the following for British Weed Foundation, which is the best kind to use, being

thoroughly cleansed and sterilized, so that there is no fear of disease being introduced by its means. The process of manufacture is of such a nature that the use of any adulterant material is impossible, therefore it consists of nothing but pure bees-wax.

	1 to 4 lb.	5 to 20 lb.
Medium brood, 7 to 8 sheets to pound ...	2s. 3d.	2s. 2d.
Thin brood, 9 to 10 sheets to pound (best to use)	2s. 4d.	2s. 3d.
Thin brood for shallow frames, 14 sheets to pound	2s. 4d.	2s. 3d.
Drone base for shallow frames, 14 sheets to pound (best to use)	2s. 4d.	2s. 3d.
Thin super for sections	2s. 8d.	2s. 7d.
Extra thin super (best to use)	3s.	2s. 11d.
If cut to fit grooved sections, over 100 squares to pound	3s.	2s. 11d.

A frame block for wiring frames costs 8*d.*, and a Woiblet Spur Embedder, 9*d.* A block for folding sections will be 1*s.* Cases for glazing sections for sale cost 1*s.* 6*d.* per dozen, or 16*s.* per gross.

Calico quilts can be made by buying unbleached calico at 2½*d.* per yard, each yard makes four. Old army blankets make good top quilts, and cost 1*s.* 6*d.* each, or six for 8*s.*

It will also be necessary to have a bee escape and clearing board to each three hives. The price of these complete is 2*s.*

For extracting the honey from shallow combs the bee-keeper will require a couple of knives for uncapping. The best pattern to use is the W.B.C., which cost 3*s.* each. These have the point turned up, so that it is quite easy to cut off the cappings from depressions which are sometimes found in the combs. Some prefer a very strong unbendable knife, a good form of which is the Bingham. The price of this is lower, being 2*s.* Where a large quantity of extracted honey is produced it is well to have a knife heater, which will hold and heat four knives at one time. These cost 4*s.* 6*d.* each. In small apiaries this may be dispensed with, and a deep jug filled with hot water can be used instead. With the latter it will be necessary to change the water when it gets cool. For large producers there are several very good steam-heated knives on the market. These save a great deal of time, and are most comfortable to work with. The price is prohibitive to the majority of persons, ranging from 15*s.* to 50*s.* each.

An extractor will also be necessary, and for a small apiary a good serviceable machine can be purchased for 16s., while for the largest apiary the cost does not exceed 50s., as for this price The Cowan can be purchased. This machine is used, and admitted to be the finest one for the purpose, in every country where bees are kept. It is not, and never has been patented, as its designer, Mr. T. W. Cowan, desired that every bee-keeper should benefit, therefore he did not receive the slightest remuneration for the time, trouble, and expense involved in designing and testing a machine to do this work. Many had tried and failed, but he gave us a machine perfect in every way. It is geared to obtain any speed desired. The handle is at the side, so that the minimum amount of fatigue is experienced in revolving the combs. The cages are reversible, so that it is unnecessary to lift out the combs to reverse them after one side has been extracted.

If a large quantity of extracted honey has to be dealt with, it will be necessary to have one or two honey ripeners and strainers. These can be purchased to hold over 1 cwt. for 12s., and to hold 60 to 70 lb. for 8s. In a small apiary it is not necessary to purchase these, as the honey can be strained straight into the 28-lb. or other size of tins used. Tins for selling in bulk cost, 7-lb. size 6d. each, or 5s. per dozen; 14-lb. size 8d. each, or 7s. per dozen; 28-lb. size 10½d. each, or 9s. 6d. per dozen. Jars holding 1 lb. cost 7s. 6d. per half gross, 13s. per gross; ½ lb., 6s. per half gross, 10s. 6d. per gross. A spring travelling crate for sections costs 3s., and a box for jars 2s. 6d.; others can be made when once the pattern has been obtained.

Queen cages are inexpensive, and it is wise to have one or two in case of emergency. A very simple one called the "pipe cover" can be bought for 4d., while a travelling introduction cage costs but 6d.

Another appliance that should be in every apiary is a painter's blow-lamp, for disinfecting hives and appliances. Though it costs 12s. 6d. the amount is soon recouped in the time saved, apart from the fact that it is the safest method of disinfecting known.

Naphthaline, to use in the hives as a disinfectant against disease and a preventative of wax moth, will cost 1s. per box. Naphthol-beta for medicating food is 1s. per packet.

Queen excluders for each hive cost 7d. each or 6s. per dozen. Swarm and comb boxes combined, for packing bees for transit, 2s. 6d.

If queen rearing is adopted then it will be necessary to have a few nucleus hives at 6*s.* each, or they can be made at a cost of 6*d.* each.

Wax is a valuable asset, therefore not a scrap should be wasted. The best method of extracting it from old combs is by means of the Solar Wax Extractor, the price of which is 15*s.* After the extractor has been purchased no further expense is entailed for fuel, as the sun provides the necessary heat for nothing. If a steam-heated extractor is used it will cost 10*s.* 6*d.*, or a very small one can be bought for 2*s.* 6*d.*

A wax smelter for fixing the foundation in plain top frames will be required. This costs 2*s.* 6*d.*

Several small tools will be required, as follows: hive tool for cleaning tops of frames and floor boards, with a lever at one end for raising frames or supers. This costs 1*s.* 6*d.* Spirit level for setting hives true, 9*d.* Round-nose pliers for turning hooks on nails for wiring, 1*s.*; and hammer, 1*s.* 6*d.*

The complete outfit for a beginner costs from 21*s.* 6*d.* to 38*s.* Swarms of bees vary in price locally. From 2*s.* 6*d.* to 3*s.* 6*d.* per lb. is the usual price when sold by weight, which is the most satisfactory method for both buyer and seller. Swarms weigh from 3 to 5 lb. It is much the best to purchase swarms. Stocks are more expensive and cost from 25*s.* to 50*s.* each.

Finally, it is a great convenience to have a separate room in which to do all the bee work, and also to store goods. In most houses such a room is available, but if not, and the bee-keeper can afford it, a manipulating house should be built. This will cost from £5 to £20 according to size, and whether the bee-keeper makes it himself or purchases it ready-made. Honey is a sticky substance to deal with, and in its manipulation some is bound to be spilt. If this is done indoors it makes a nasty mess, which does not tend to smooth the temper of the women folk. It is also necessary to have the room bee-proof, or when extracting is taking place, robbing will be induced. The windows should be made to swing on pivots, so that it is an easy matter to tip out the bees which get in through the door, or are carried in in the supers and collect on the glass. A good strong bench will be required, also a cupboard for storing those goods which may be injured by dust. A large cupboard for fumigating combs will also be found very useful.

MARKETING

With regard to the greater portion of agricultural produce, the problem of marketing is a difficult one. In the case of bee-keeping this is not so, provided the producer has a fair amount of energy and business capacity; if not, then no matter what he has to dispose of, he will find it a difficulty. The chief factors in marketing bee produce are: (1) to sell nothing but the best, (2) proper grading, (3) cleanliness, (4) to pack carefully, (5) to be able to give customers a constant supply all the year round. This applies to selling both wholesale and retail. A good connection can be obtained and more money made by selling retail, but of course more trouble is entailed.

In marketing honey, the first consideration should be whether the demand will be for comb or extracted. If the bee-keeper resides in a district where the greater portion of the population are well-to-do people, such as university or scholastic towns or near watering-places, then without a doubt comb honey will sell the best and must be worked for. The drawback to producing comb honey is the difficulty in storing it, on account of its liability to granulate. If this takes place, then it is impossible to sell it; therefore it is necessary to market it quickly, or to build a special room for storing it. Comb honey is purchased by well-to-do people on account of its delicate appearance, and also because they have an idea that in purchasing it they are bound to get an unadulterated article. They also imagine that honey must be liquid, and for this reason refuse to purchase granulated, or, as it is termed, candied honey. By means of bee-keepers' associations and also by exhibitions the public are being educated to the fact that in the granulation of honey they have an absolute guarantee of its purity, and gradually the use of granulated honey is becoming more popular. The addition of adulterants, even in minute quantities, prevents granulation, especially glucose, which is the material generally used. The insistence of having liquid honey by the consumer plays into the hands of unscrupulous people. Sections are more difficult to produce than extracted honey, as the bees are more prone to swarm on account of the necessity for wrapping down the racks very warmly. By working with metal dividers to keep the comb within the woodwork of the sections the rack is converted into twenty-one miniature colonies of bees, in each of which a temperature of 98° F. is necessary for the secretion of wax, hence the necessity for plenty of covering.

The production of sections is not so profitable as extracted honey. In marketing them a most valuable asset in the shape of bees-wax is sold, whereas in the case of extracted honey this is retained. When we consider that to make 1 lb. of wax the bees consume from 10 to 20 lb. of honey, it will be readily understood how great a saving is effected by this method.

When the sections in the rack are sealed over they must be removed at once, otherwise they will be spoilt either by travel staining or by the bees thickening the wax cappings, which gives them a dull, heavy appearance. The rack is then taken indoors, and the sections carefully removed and cleaned of all small pieces of brace-comb and propolis. The bulk of this can be taken off by means of a long-bladed penknife. This done, the wood should be scraped with a piece of broken glass or a proper metal scraper. The latter is difficult for ordinary people to sharpen, therefore glass is the best, for as soon as the sharp edge is worn off a fresh piece can be utilized. In the operation of handling and cleaning, care should be taken not to grip the section across the narrow way, or the comb will be damaged with the finger and thumb. They should be held across the $\frac{1}{4}$ -way, so that only the wood is touched. The next work is to grade the sections into two qualities—firsts and seconds. Those which are filled right to the wood, well sealed over with an even thin capping and of a uniform light colour right through, consisting of worker cells and weighing 16 oz., should be placed in the first category; while any that are not so well filled, having pop-holes, thick or uneven in the capping, darker in colour or containing honey of two shades, drone cells, and weigh under 16 oz. but not less than 13 oz., are placed in the latter. Any of less weight than this, or those not sealed over, should not be offered for sale, but should be extracted and saved for baits to put in the racks the following year.

Before sending them off to customers it is necessary to glaze the sections to protect them from dust and dirt, also to prevent the attacks of flies and wasps and prevent damage being done to the comb when handled by careless and inexperienced persons. In order that they may be dispatched looking as clean and neat as possible, it is advisable to store them until required and glaze them just before sending them out. The storage of comb honey to keep it in good condition is difficult.

To prevent granulation it is necessary to protect it from the light, and also to keep it in a fairly warm place. Light and cold

are the main factors in causing granulation. They must also be kept free from dust and damp. A cupboard near a chimney flue is a good position for the purpose. Place the sections back in the rack and wrap them up well with newspaper and store until wanted. If a large number of sections are produced, then it will pay to construct a special room to keep them in. This is best made in the form of an underground cellar, the roof of which is covered with earth to the depth of about 18 in., on the same lines that an apple store is made. It should have double doors, with a space of 1 ft. between them, so that an even temperature can be maintained. In very cold weather the temperature can be regulated by means of a paraffin stove, or if there is a greenhouse on the place the cellar can be made near to it and a hot-water pipe connected to the boiler of the greenhouse and run through the cellar. In such a room the sections can be kept twelve months without deterioration.

As the sections are required they are brought out and glazed. This is done by having squares of glass just the size of the section, i.e. $4\frac{1}{2}$ in., and narrow strips of lace paper which are made for the purpose, and which can be obtained

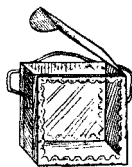


Fig. 3

from any appliance manufacturer. Strong flour or starch paste is made. The section is laid flat on the table, a square of glass placed on the top, and after pasting one side of a strip of the lace paper it is first stuck round the wood of the section and then brought over the glass, so that it adheres about $\frac{3}{8}$ in. over the edge, giving a very nice appearance. Proceed with other sections until the first one is set. The opposite sides can then be treated in the same manner. Instead of leaving a portion of the woodwork bare and unsightly, a better appearance is given if a strip of plain white, or pale-blue paper $1\frac{1}{2}$ in. wide is pasted right round the section.

If the bee-keeper does not care to take this trouble, or has not the time to glaze the sections, cardboard cases having glass on both sides, as shown in fig. 3 may be purchased; but glazing the section itself is the cheapest method, and, if done neatly, gives the best appearance. It is a mistake to sell sections unglazed, as, being dealt with by inexperienced people, they are soon in such a bad condition that they are neither creditable to their producer nor the salesman, often resulting in the latter becoming so disgusted that he will have no further dealings with comb honey.

Having glazed the sections it is necessary to pack them properly, and of all operations this is the one to which the majority of bee-keepers pay the least attention. Good sections are produced and got up well for selling, then through careless packing, time, trouble, and material are wasted by the sections arriving at their destination in a damaged condition. For small consignments of, say, a dozen sections, it is best to use a spring crate (fig. 4), in which they travel quite safely. As the comb is exposed to view by means of glass on either side, the crate receives more careful handling by railway porters than if it is hidden away in a packing-case. If several dozen sections are to be sent in one consignment, then the cost in packages and carriage would be too great to send each dozen in one of these crates. It is not

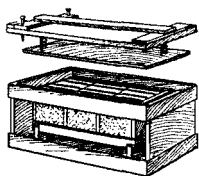


Fig. 4

advisable to have spring crates to hold more than one dozen, as the weight is too much and therefore they get broken. Tate's cube-sugar boxes make good packing-cases, and they will carry three dozen sections very comfortably. To facilitate handling it is necessary to put a handle on each end of the box. This can be done by boring a couple of $\frac{1}{2}$ -in.

holes, 8 in. apart, and about 9 in. from the top; pass a strong cord through both and knot the ends inside the box. The sections should be wrapped in half-dozen, newspaper of double thickness will do, a string over the long way of the parcel will hold them secure. The best packing material is straw, as it gives more resistance than hay. As the greatest concussion is at the bottom care should be taken to put a good pad of packing material in that position. It is no unusual thing to find the reverse of this, the box having about an inch of packing at the bottom, which does not give sufficient protection, with 8 or 10 in. of straw at the top, where it is not needed. Place three packages of sections on the bottom packing and the other three packages on the top of these, without any straw between. Pack tightly all round the outside with straw, then heap the box full on the top so that the lid has to have pressure applied to get it down for nailing; the object being to get the sections packed as tightly as possible in a bed with plenty of resistance. If not packed tightly, so that there is no possibility of their moving, they will damage by chafing. Unglazed sections can be packed in the same way, but when wrapping in the half-dozen packages it will be

necessary to place a 4½-in. square of thin wood or good stout card-board at either end, to prevent the face of the end sections being damaged when packing in the box. Sections packed in this manner will travel quite safely even by goods train. Every precaution should be taken for their safety, as all railway companies refuse to carry comb honey except at owners' risk, so if they are damaged it is impossible to get compensation.

Comb honey is too fragile to send by parcel post, and this should never be attempted, as it not only results in failure, but the leaking honey is liable to damage other parcels in transit.

EXTRACTED HONEY

This is the most profitable method to adopt, providing that, as already stated, a market of the right kind is handy. More extracted than comb honey can be obtained from the hives as the combs are never destroyed. Being kept free from brood they are quite clean, thus the honey which would be consumed for the secretion of wax is saved. By having combs already built out, a harvest is often secured during a few days of fine weather, which time in the case of sections would be expended in comb building. The honey can be stored and kept for any length of time. Granulation does not matter, as it is an easy matter to reliquefy it when it is out of the comb. Instead of removing the honey as soon as sealed over, it should be allowed to remain on the hive as long as possible; the longer it remains (within reason) the better its condition will be. It will get thoroughly ripe, i.e. all the excessive moisture will be evaporated and the honey will be thick. When the first shallow frame super is two-thirds full another one is given, so that the bees go on completing the partly-filled one and commence work in the second. In this way it is quite easy to prevent swarming, as the shallow combs are not worked with dividers between, so that the bees are in one large cluster. It is best to remove all the shallow combs at one time, so that it can be made into three grades while in the comb. This is easily accomplished by holding the combs up to the light. The grades should be light, medium, and dark. The former will fetch the best price, as the majority of people in this country prefer it so. The medium will fetch nearly as much, while the dark will have to be sold the cheapest. Care should be taken to extract all the unsealed honey from the combs first, as this being thin and liable to ferment will

spoil the bulk. It can be put in an open vessel with muslin over to keep out insects and placed in a warm room to ripen.

The honey is now extracted and carefully strained, first through a perforated tin strainer, or better still through wire cloth, and then through muslin, to remove all the tiny particles of wax which will get in during the process of extracting. If it is going to be marketed straight away in jars, then it should be placed in a ripener, which is a large tin having a treacle tap at the bottom, and allowed to stand for forty-eight hours to allow the air bubbles to rise to the top in the form of scum. The honey can then be run into jars holding either 1 lb. or $\frac{1}{2}$ lb. These are of clear flint glass with a hard bright metal screw cap. They should be well washed and allowed to drain perfectly dry before putting the honey into them. These jars are the most convenient receptacles to put the honey in, but at times customers require it to be put up in vessels of different shapes, and this wish should always be gratified if possible. The two sizes mentioned are the commercial ones; it is very rarely that $\frac{1}{2}$ -lb. jars are used, though occasionally these are asked for. The dark honey can often be disposed of by putting it into globe-shaped earthenware vessels, such as are used for jam, though in some districts this is unnecessary, as the people prefer the dark honey, and as a rule they are wise in their choice, for often it has a much better flavour than the light. If granulated honey is desired it is advisable to put the honey into the jars as soon as it is extracted, and allow it to granulate in the vessel in which it is to be sold. These jars should be exposed to the light, when the honey will granulate and become quite solid.

A neat label should be used on the jars. The majority of beekeepers' associations supply one of their own design with a registered number on each, so that it is possible to trace the producer. This gives the public confidence in their purchase. The following or similar wording is upon the label for the information of the purchaser:—

TAKE NOTICE.—*All Pure Honey* will granulate (or candy) in cool weather, and this candying is, in fact, the best proof of its purity. It can easily and quickly be restored to its liquid state by immersing the jar in a vessel of water, then heat gradually till the finger can be comfortably held in the water. When thoroughly melted to clearness, cover the honey down while hot, and it will not then candy again for a long time. The jar, while heating, should stand on strips of wood, so that there is water below as well as around it.



Photo Sport and General

81
OPENING A HIVE TO EXAMINE THE COMBS. SMOKING THE BEES TO STUPEFY AND KEEP THEM QUIET DURING THE OPERATION



Some bee-keepers prefer to have a label of their own design, which they register, so that their honey is distinguished from that of other people.

The packing of extracted honey in jars is quite simple compared with comb honey. For odd dozens a box (fig. 5) can be used, for larger quantities it is well to again utilize the Tate cube-sugar boxes or others of a similar shape. Straw is the packing material which should be used, and the same remarks with regard to the amount of material at the bottom of the box for sections apply in this case. Each jar should be wrapped in a separate piece of newspaper, which forms a protecting pad when they are packed together. It is better to put a layer of straw between the rows, and also a thin layer on the top of

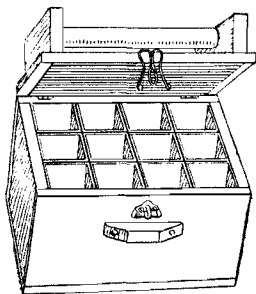


Fig. 5

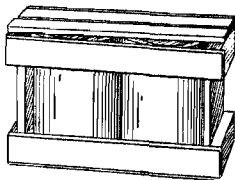


Fig. 6

each tier of jars. It is not advisable to put more than six dozen 1-lb. jars in one box, or, being heavy, it is likely to get handled roughly, and some of the jars will get broken even if they are packed ever so carefully. The leaking honey entails a lot of labour in cleaning those upon which it runs. Odd jars, or even two or three together, can be packed to travel through the post in safety if plenty of corrugated paper is wrapped round them. It is better to send granulated honey through the post than liquid.

If the honey is to be stored or sold in bulk, then it should be placed in air-tight tins. The best size is the 28-lb. lever lid, which is sold for the purpose. No larger size should be used, as they are awkward to handle, especially if the honey has to be reliquefied. As bulk honey is sold by the hundredweight it is easy to gauge, as each tin is $\frac{1}{4}$ cwt. For transit a crate holding two tins (fig. 6) is made. These make reasonable packages for handling. The tins

may be had in either round or square shape, whichever is fancied the best.

Some families like to buy a fair quantity of honey at one time without the expense of the jars, so that a few 14- or 7-lb. tins should be kept for supplying this demand.

The tinned honey should be stored in a dry, cool place until required, and, to prevent rust, rub the outside of the tins with a vaseline cloth.

To reliquefy when required for putting into jars, stand the tin in the copper or some large vessel surrounded by water, taking care to put slats of wood along the bottom for the tin to stand on to prevent burning. The water should reach nearly to the top of the tin. It is then heated, but the temperature must not go higher than 160° F. If a thermometer is not obtainable, then the finger can be used as a gauge. The water should be heated so that the finger can be borne in it for a few seconds. If this is exceeded, then the aroma and flavour of the honey is spoilt.

The prices obtainable are approximately as follows:—

SECTIONS

Single ... ..	... 10 <i>d.</i> to 1 <i>s.</i> 3 <i>d.</i> each.
First grade, glazed ...	... 10 <i>s.</i> to 12 <i>s.</i> per dozen.
" unglazed ...	... 8 <i>s.</i> 6 <i>d.</i> to 10 <i>s.</i> 6 <i>d.</i> "
Seconds, glazed ...	... 9 <i>s.</i> to 10 <i>s.</i> "
" unglazed ...	... 7 <i>s.</i> 6 <i>d.</i> to 8 <i>s.</i> 6 <i>d.</i> "
Heather sections ...	... 12 <i>s.</i> to 24 <i>s.</i> "

JARS

Single ... ..	... 10 <i>d.</i> to 1 <i>s.</i> each.
Light ... ..	... 9 <i>s.</i> 6 <i>d.</i> to 10 <i>s.</i> per dozen.
Medium ... ..	... 9 <i>s.</i> to 9 <i>s.</i> 6 <i>d.</i> "
Dark ... ..	... 8 <i>s.</i> to 8 <i>s.</i> 6 <i>d.</i> "
Heather ... ..	... 11 <i>s.</i> to 18 <i>s.</i> "

BULK

7-lb. tins ...	... 5 <i>s.</i> 6 <i>d.</i> each.
14-lb. tins ...	... 10 <i>s.</i> 6 <i>d.</i> "
Light ... ..	... 56 <i>s.</i> to 70 <i>s.</i> per cwt.
Medium ... ..	... 50 <i>s.</i> to 56 <i>s.</i> "
Dark ... ..	... 45 <i>s.</i> to 50 <i>s.</i> "

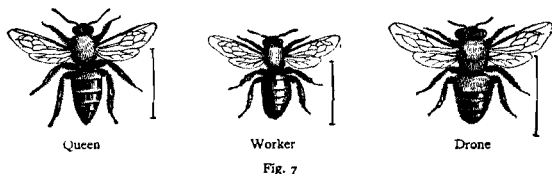
Having obtained customers, it is soon possible to gauge the amount they will require each year, and at least one year's supply

should be kept in store. The honey sent should always be uniform. To be able to do this in a season of scarcity, it is well to find out producers in districts where the flow is of a similar nature, so that purchases may be made from them to keep up the stock and so retain customers. This is one of the essentials of good marketing.

MANAGEMENT OF BEES

THE CONSTITUENTS OF THE BEE COMMUNITY

For the wellbeing of the bees and success in working them, it is necessary that the bee-keeper should understand the habits, offices, and functions of the inhabitants of the hive, yet how very few take the trouble to learn this, being satisfied to work by



rule of thumb—a method which may succeed in a good season and district, but will fail entirely in indifferent or bad ones. The latter will make the careful bee-keeper use all his knowledge and ingenuity to secure at least some return from the bees; while in the special branches of apiculture, such as queen rearing, a knowledge of the characteristics possessed by bees is absolutely essential.

In Great Britain there are over two hundred varieties of wild bees, the majority of them solitary, and with the exception of the hive bee, *Apis mellifica* (which is really wild by nature), none are social during the winter. The Humble Bee is social in the summer-time, but only the queens live during the winter. They hide away in crevices or burrow down into the ground, where they hibernate during the winter months and commence the nest in the spring.

The whole family of bees are worth studying, as we find practically every trade represented. There are Carpenter, Mason, Carder, and Upholsterer Bees, &c.

The bee is very different from, and should not be confounded

with, the wasp, which is carnivorous in habit and very pugnacious, often stinging without any provocation whatever.

The bee community is made up of three kinds in the summer—one queen, forty to fifty thousand workers, and a few hundred drones, as shown at fig. 7. The queen is the most important bee in the hive, not because she rules, which might be supposed from her name, but because she is a fully-developed female, and, after mating with the drone, the only one capable of reproducing either sex. A more correct definition is used by the Germans, who speak of her as "the mother bee".

In appearance the queen is quite different from the other bees, being longer in body. The abdomen is more slender and tapering, the wings in comparison to the size of the body are shorter, while the back is darker in colour. The under side of the abdomen and the joints of the legs nearest the body have a yellow tinge. Under natural conditions the queen will live from four to five years, but is most prolific when two years old, and under ordinary circumstances should not be kept beyond that period. She is capable of laying from two to three thousand eggs per day, which is astonishing when we consider that each egg laid is perfect, containing yolk, white, and is covered with a shell. To enable her to lay this large number of eggs she is attended very assiduously by the workers, who clean her body, and also digest her food and give it to her ready for assimilation.

We have here indicated to us very plainly that the workers are the true rulers of the hive. It is only natural to expect that in her maternal duties the queen would exercise her own will. This is not so. The workers regulate the number of eggs laid by the amount of food given to the queen; the reduction of food means limitation in the number of eggs produced.

There is but one queen in the hive; if by chance two queens get together they fight until one is killed. As a rule the eldest, for after a certain age the queen cannot use her sting with fatal effect, as the formic acid—which is the poison injected by the sting—turns gelatinous and is incapable of ejection. In this way nature provides for the survival of the fittest.

The queen leaves the hive only on two occasions. First as a virgin for mating with the drone (fertilization can only take place while on the wing, and when once accomplished it lasts for life), the second occasion when accompanying a swarm.

On account of her maternal duties the queen receives great

attention in the hive. Under normal conditions she will often be seen surrounded by workers, who feed, clean, and protect her. If danger threatens, then no attention is paid to the queen; she is left to take care of herself.

WORKERS

These are the labourers of the hive. They do all the work. The well-being of the stock depends upon them, with the exception of the reproductive functions. The workers are undeveloped females, not neuters or hermaphrodite bees as termed by so many writers. They are the smallest bees in the hive. At times they are capable of reproducing, but owing to retardment of the sexual organs they are incapable of mating, so their eggs being infertile produce drones only. This is one of the curiosities of bee life, called parthenogenesis, i.e. reproduction without fertilization; a queen which has not been mated will also lay, but the eggs produce males only. The worker is an unselfish little creature, who works hard, not for her own benefit, but for the good of the community. So zealous is she that in from six to eight weeks in the summertime she is thoroughly worn out and dies. Those workers which hatch out in the autumn live through the winter as they do little work, and commence the work of brood-rearing the next year. The worker possesses a sting, which is given to it as a weapon of defence and not of offence. It will very rarely use it unless it is molested or suspects molestation, for in so doing it loses its life, as the sting is left behind.

The work which this bee does comprises the following: gathers nectar and converts it into honey, which is stored in the cells and sealed over; secretes the wax from which the combs are made; builds the combs; hatches the eggs; digests the food for and feeds the larvæ, queen, and drones; cleans down the hive; carries out the dead, and defends the home.

DRONES

These are the male bees, and are brought into existence in the spring towards the swarming season for the fertilization of young queens. They are more bulky than either queen or worker, have no sting, and therefore cannot defend themselves. Their food is digested and given to them by the workers until the autumn, when, as the swarming season is over, they are no longer needed, and as the food

stored is required for the worker bees during the winter, they are killed off. The workers refuse to give them food and also prevent them from obtaining it themselves, so that they become very weak. In this condition they are an easy prey for the workers, who injure their wings by biting them at the root. When injured in this way they are cast from the hive on to the ground in front, when, being unable to rise, they are either eaten by enemies or perish through cold and wet. The drone has a free pass into any hive, and will be fed and tolerated in one as readily as in another. Not so the worker. Bees recognize each other by smell, and woe betide a worker that attempts to enter the wrong home, for it is promptly killed.

A few words on the anatomy of the bee will not be out of place, especially as we will consider only those portions which are actually concerned in the practical work of the hive. The body of the bee, like most insects, is divided into three parts—the head, thorax, and abdomen. The three kinds of bees are anatomically constructed to carry out the work peculiar to each, and therefore vary in detail. The head is the most important, as in it is situated the tongue, by means of which nectar is gathered. They vary in shape, and when viewed from the front the head of the worker is triangular, in the queen heart-shaped, while the drone's head is smaller and perfectly round. On the front of the head there is a pair of antennæ or feelers, hornlike projections which are cylindrical in shape and fastened to the head by a ball-and-socket joint which allows movement in any direction. These are organs of touch, and are very sensitive. They are also organs of intercommunication, this being carried out by the bees tapping upon each other's head. The antennæ enable the bee to find its way about in the semi-darkness of the hive. Sex can be distinguished by means of the antennæ; they are made up of a number of articulated joints, of which there are twelve in the female and thirteen in the male. The bee has five eyes, two compound and three simple. The former are situated on the side of the head, and in the male meet right at the top. They consist of a number of six-sided lenses, as many as 5000 being found in one compound eye of the worker. The compound eyes are used for long vision. The simple eyes contain one lens only, and in the female are situated at the top of the head in the form of a triangle, while in the male they are in the centre of the face, owing to the compound eyes meeting at the top. They are used for short vision, and also in the semi-darkness of the hive.

The tongue is a beautifully-constructed organ, and varies in length in the three kinds, the worker's being the longest, queen's next, and drone's the shortest of all. The tongue is made up of five parts, and when not in use is rolled up under the jaws. It consists of the true tongue or ligula, and labial palpi and maxillæ. The two latter are in pairs and concave, so that when closed together they form a tube in which the tongue works backward and forward when taking up large quantities of nectar. If a small quantity is being taken, then it passes up a groove on the under side of the ligula and not by means of the labial palpi and maxillæ. So fine is this groove that it would require a stream of nectar from it 5 miles long to make 1 lb. of honey. At the end of the worker's tongue is a flattened portion, like a spoon, which is slightly hollow and contains a number of hooked hairs. This is used as a brush for collecting minute quantities of nectar. As the queen and drone do not go out foraging their tongue does not have this spoon but is pointed.

The thorax is the strongest part of the body of the bee, for attached to it are the organs of locomotion, the wings and legs. The former consist of two pairs which, when not in use, fold away very neatly on the back of the bee, owing to their being divided, so that they are not troublesome to the bee when entering the cells to feed the young or deposit honey. When thrown forward for flight, each pair is made into one by means of a number of little hooklets on the hind wing, grasping into a flange on the front one.

The legs, of which there are three pairs, are also attached to the thorax, which is made up of three segments: the pro-mesa- and meta-thorax; a pair of legs is attached to each segment. The legs are used for other purposes than walking. Upon them are found mechanical devices which are used by the bee for various purposes, and they vary in the three kinds of bee. The legs of the worker are the most highly developed. The front pair of legs are practically the same in all three kinds, and have in the first joint from the body a semicircular cavity lined with hair, the other side of the circle being completed by means of a lever. This cavity, called the sinus, is used for cleansing the antennæ, which, being very sensitive organs, are kept scrupulously clean by the bee. Foreign matter upon them irritates the bee just as it would in the human eye, therefore, by placing the basal portion of the antennæ in the cavity, shutting down the lever and drawing it through, it is freed from all dirt. It is possible to see the bee doing this, as it puts

first one leg and then the other over its head to get the antennæ into the position described. Along the front edge of the bottom joint of the leg are a number of straight spiny hairs, which are used as a comb for cleaning the compound eyes. Growing out between the six-sided lenses are a number of hairs which protect the eye. Upon these dust collects, and hinders the vision of the bee until cleared away by the method described. There is also a tuft of hairs upon the first joint, which is used to clean down the body. The second pair of legs are identical in all three kinds, and have nothing of note upon them except a spine on the first joint, the use of which is uncertain. The hind pair of legs in the worker have on the outer side of the joint nearest the body a slight cavity, curving over which are a number of hairs. This is called the pollen basket, as by its means the pollen, which becomes dusted upon the body of the bee when it is collecting nectar from the flowers, is carried home to the hive. Upon those days when the bees are working freely a large number will be seen going into the hive with their hind legs laden with pellets of pollen of various colours. Propolis, which is a sticky substance gathered from the buds and limbs of trees, is also carried home in the pollen baskets. In the first joint is situated the wax pincers, the bottom jaw of which is plain, while the top one has a number of short, stiff spiny hairs. The wax scales form on the under side of the abdomen, and as the outer covering of the bee is made up of a hard substance called chitine, it is impossible for it to get its head down to remove these with the mouth, so they are gripped with the pincers. The spines pierce the scale and bring it away, and it is then passed up to the comb builders. The queen and drone do not possess either pollen basket or wax pincers. On the inside of the bottom joint of the hind leg are ten rows of down-pointing strong hairs, which are used for cleaning down the body.

At the end of the legs is found the foot, which, by its peculiar construction, enables the bee to creep over a rough or smooth surface or even upside down. It consists of a pair of claws exactly like the claws of a crab; between these is a pad, or, as it is called, a pulvillus, which is concave, and has a sticky secretion. When passing over a rough surface the pulvillus is retracted and the claws thrown forward for walking. They are also in the same position when the bees are hanging together for wax making, or when clustering as a swarm, so that the bees can hang on to each other. When passing over a smooth surface the claws are retracted, and

the pulvillus thrown forward, the sticky secretion adheres to the surface and so enables the bee to walk quite easily.

If a bee is allowed to walk over a piece of glass and the surface is then examined with a lens, its footsteps can be traced by the tiny particles of sticky secretion left behind; or again, if the surface of the glass is moistened by breathing, or dusted with french chalk, the bee will be unable to walk upon it.

The abdomen is made up of a number of rings or segments, six in the female and seven in the male. On either side, just at the joints, there are tiny holes called spiracles, and it is through these that the bee breathes. If its body becomes smeared with honey these are stopped up and the bee is therefore suffocated. Inside the abdomen are large air sacs, really the lungs of the bee, which are connected to the spiracles by tubes called trachea; other trachea permeate every part of the body for the conveyance of oxygen.

On the under side of the abdomen of the worker, in the last four segments, are the wax pockets in pairs, in which wax is secreted. These are not present in the case of the queen and the drone.

Inside the body of the bee is found the honey sac, or stomach. Nectar is swallowed down into this, where it goes through a chemical change and is converted into honey, when it is thrown back and stored in the cells. At the bottom of the honey sac is the stomach mouth, over which the bee has control, so that when hungry this mouth, which is formed like a valve, is opened, and sufficient food allowed to pass into the stomach proper to satisfy the bee's hunger. It is then closed, and the process of honey-making is continued.

The bee belongs to the cold, colourless-blooded creatures. The heart, termed the dorsal vessel, extends through the whole length of the body, and works by ventricles and valves. The sting is made up of three parts—a sheath and two lancets. The latter are barbed, and it is on this account that the bee can rarely withdraw the weapon after it is once inserted. The worker's sting is quite straight, while that of the queen is curved, the barbs also being rudimentary, so that her sting can be withdrawn.

LIFE-HISTORY OF THE BEE

Bees are brought into existence by means of eggs; these are laid in the cells, which, grouped together, constitute the comb. The combs are made of bees-wax and a very small quantity of pollen. The cells of which they are made up consist of five kinds: worker, drone, queen, attachment, and transition cells. The worker cells are the smallest, being $\frac{1}{4}$ in. in diameter. They are six-sided, this being the only shape which will fit together without waste of space in which a round body can grow. They are built out horizontally from a midrib, and have a slight upward inclination so that they retain the grub during its growth, and also the honey when it is stored. Drone cells are larger, being $\frac{1}{4}$ in. in diameter, in all other respects they are built in the same manner as the worker cells. Queen cells are only built during the swarming season, or if by accident the queen is killed or lost. Instead of being horizontal they are pendulous, being about 1 in. in length and $\frac{1}{4}$ in. in diameter, and have the opening at the bottom, while in all other cases the cells open sideways. Queen cells are made very stout, and consist of wax with a liberal mixture of pollen. They also have upon them a number of depressions or indentations, which, by forming ribs, make the cell stronger and the cavities allow of porosity. Transition cells are those between when drone cells are being merged into worker, or vice versa; they are irregular in shape and are used only for the storage of food. Attachment cells are those by means of which the bee attaches the combs to the material upon which they are being built; they are stored with honey only.

After mating with the drone, the queen is capable of laying fertile or infertile eggs. At the interior base of her abdomen is a little sac, into which the semen obtained from the drone enters and is retained. The queen is mated but once in her life, ever after being capable of laying at will either fertile or infertile eggs. In the end of the egg is a tiny hole called the micropyle, through which the fertilizing substance is forced by the queen at the time of laying. The fertile eggs produce females and the infertile ones males only. In the summer time the queen is in full lay, and she can then be seen passing over the combs searching for empty cells, into which, when found, she inserts her abdomen and deposits an egg.

We will take first of all an egg laid in the worker cell. It is

incubated for three days, the temperature required being 98° F.; then from it hatches a little grub, which is fed on pap or digested food for three days. The grub floats in this food, which it not only takes through the mouth but also absorbs through the skin, therefore it grows very rapidly. At the end of three days the grub is weaned, that is, it is fed on honey and partly-digested pollen instead of the pap. The grub is fed until it is nine days old, when it is sealed over with a porous capping made of pollen and wax. The creature then passes through all the stages incidental to insect life, i.e. it spins a cocoon, rests, becomes a nymph, and eventually an imago or perfect bee, the time occupied being twenty-one days. On the twenty-second day the worker eats its way from the cell, and in the course of a few hours commences to work, acting for the first fourteen days (during which period it does not leave the hive) as nurse to its sisters, making the pap upon which they are fed. At the end of a fortnight it becomes a foraging bee working in the fields.

Queens are produced like the workers from fertile eggs. Either a queen cell is built in which the queen lays an egg, or one is carried and placed in it by the workers, or they enlarge the base of a worker cell already containing an egg. This is incubated in the same manner and for the same period as that which produces a worker. The grub is fed on the same kind of food, but with the difference that no weaning takes place; the grub is sealed over on the ninth day and goes through identically the same changes as the worker, with the difference that the time occupied is shorter, being about seventeen days. Being reared in a larger cell, and having the rich food given right throughout its existence in the cell, a female fully developed in all her organs is produced, capable of being mated and reproducing either sex. Usually the first princess out goes to the other cells containing her royal sisters, of which there may be any number up to a dozen, tears down the side wall and kills the inmate, thus precluding the possibility of a rival. The princess remains in the hive for five days, then leaves on her wedding trip. After marriage she returns to the hive, and within forty-eight hours commences her maternal duties.

In the springtime drones are produced; an infertile egg is laid in the drone cell, incubation takes place as in the case of the worker and queen, and although there is no male stimulus in the egg a grub hatches out on the third day, and is fed on pap for four days, when it is weaned. The creature passes through all the stages detailed

for worker and queen, the period of development only being different, occupying twenty-four days. On the twenty-fifth day the drone emerges and remains in the hive for fourteen days, and then commences to fly. The capping covering drone brood stands out very prominently, and by this alone, apart from the size of the cell, is easily recognized. From capping to capping through the comb drone cells measure $1\frac{1}{4}$ in., worker cells $\frac{7}{8}$ in. The space between the face of combs containing honey sealed over is $\frac{1}{4}$ in., while between capped brood it is $\frac{3}{8}$ in.

In the autumn both worker and drone cells which have been used for brood rearing are gradually filled with honey for consumption during the winter months. The amount of brood reared increases gradually from January to July; from then until November it decreases until it ceases altogether.

SWARMS, NATURAL AND ARTIFICIAL

As a rule the difference between a swarm, a colony, and a stock is but little understood. A swarm is a cluster of bees with a queen, but no combs; a colony consists of the bees and queen together with their combs; while a stock includes bees, combs, and hive. Yet at Christmas-time a bee-keeper will very often tell you he has so many *swarms* of bees in the garden.

Swarming is the result of overcrowding. About the end of January or the first week in February the queen commences to lay. Gradually the cluster of bees in the hive expands as the number increases, allowing more space to be covered and kept warm by the workers. More food is given to the queen, thus enabling her to lay a larger number of eggs per day. This goes on until nearly all the cells in the combs are filled with eggs, larvæ, and brood in all stages. The population is now increasing to such an extent that the space in the brood chamber is insufficient to contain all the little labourers. The bees prepare for a division of the colony by rearing several young queens. When one of these princesses is about three days off emerging from the cell, on a fine warm morning there is great excitement in the hive, and eventually the old bees, accompanied by the old queen, come out, and after circling round in the air for a little time settle in a large cluster on the branch of a tree, in the hedgerow, or in some spot more or less convenient for the bee-keeper to hive them from.

Should the swarm seem disposed not to settle, the best thing

to do is to take a garden syringe and spray water well above the flying bees. Failing the syringe, garden soil may be thrown by the handful amongst them. Either of the above methods will generally cause the bees to settle very quickly. As soon as all the flying bees have joined the cluster the swarm should be hived into a straw skep and allowed to stand near the place of clustering, well shaded from the sun, until the evening, when they can be put into the frame hive.

To hive a swarm, if it is clustered so that the skep can be got underneath, is a very easy matter. A vigorous shake of the branch will dislodge the bees so that they fall into the skep, which can then be reversed and placed on the ground. If on a branch that can be spared, shaking is not necessary. In this case the bees can be put straight into the frame hive, which has been prepared as stated later on. The branch may be cut off with pruning shears, carried to the hive, and laid on the board in front of the entrance, when all the bees will run into the hive. If the bees settle on the bole of a tree, on a post, or any position from which they cannot be dislodged by shaking, they should not, as is generally the case, be brushed off. This brushing will irritate the bees and cause them to sting.

The fact that bees will always run up hill should be borne in mind, so by fastening the skep with the edge touching the article above the cluster, the bees will gradually run up into the skep. If it is desirable to hurry them, use either the smoker sparingly, a carbolic cloth, or a feather dipped in a weak solution of carbolic acid, at the base of the cluster. This will make them run up more quickly. Having secured the swarm, the skep should be well ventilated by raising one edge on to a brick, also it should be shaded from the sun either by an open umbrella, a cloth, or sack damped with cold water. This will prevent the bees becoming hot and excited, which may cause them to issue again. The frame hive should have been prepared during the winter months for the reception of the swarm. It should be well painted, the frames fitted with full sheets of worker base weed foundation, which is pure beeswax sheeted and impressed with the base of cells. By its use the bee-keeper can obtain perfectly straight combs in any desired position, and either worker or drone cells as desired. That containing ten sheets to the pound is the best. The foundation should also be wired to prevent falling and buckling. This will also make the combs stronger when drawn out, so that if they have to travel either by trap or train, or if handled by a careless manipulator,

there is not so much fear of them breaking down. It is best to use the plain top bar frame instead of the split ones, which provide such a good harbour for the larvæ of the wax moth and dirt.

The foundation can easily be fastened into these bars by means of a little molten wax. The hive legs should stand on bricks, and the floor board be set perfectly level (by means of a spirit level) from side to side, and slant just a little towards the entrance to allow the moisture which condenses inside the hive to drain out. A piece of unbleached calico will form a covering for the tops of the frames; in this a 3-in. flap should be cut in the centre to allow the bees access to a feeder if required. Place a board slanting from the alighting board to the ground, and throw over this a cloth to cover the chinks. Prop up the entrance of the hive about a couple of inches, and all is then ready for the reception of the swarm. The operation of hiving should be performed in the evening, not too late, about six or seven o'clock, and not in the heat of the day. To make quite sure that the bees will stay in the hive, just before they are run in, place in the centre of the hive one comb shaken clear of bees from another stock containing eggs, brood, and larvæ, as bees very rarely forsake brood. A bottle of warm syrup should also be placed over the feed hole, and the whole wrapped down warm by means of extra blankets. The swarm is now shaken on to the board, when the bees will travel up the inclined plane into the hive. Occasionally the swarm is hived from the top of the frames. This should never be done if it is possible to avoid it; but if the weather turns out wet or cold, and it is absolutely necessary to hive the bees at once, five frames only should be left in the brood chamber. These should be placed as far apart as possible. The bees are shaken down into the brood chamber, and the quilt put over as quickly as possible and left until the morning, when the bees will have clustered on the frames. The frames can then be closed together and the other five given.

Second swarms or casts sometimes issue from the hive, especially from the old-fashioned straw skep. These as a rule are of little use, being headed by virgin queens, which, being very lively, often fly far before clustering. These casts should either be returned to the parent colony after destroying all queen cells and killing all virgin queens except one, or they may be united to weak stocks, or used for making nuclei for queen rearing. Better still, join two or three casts together and so form one strong lot.

Artificial swarms can easily be made from skeps by driving out

about a quart of bees together with the old queen into a new hive. This is then placed on the stand occupied by the parent stock, while the old hive is moved to some other part of the garden, where the bees remaining will rear for themselves a young queen. To make an artificial swarm from a frame hive, choose a warm day when the bees are flying freely. Examine the combs, which should be well crowded with bees, until the queen is found. Place the comb, bees, queen and all into the centre of a new hive, with nine frames fitted with full sheets of foundation. Put the quilt and food bottle on the top, wrap all down snug and warm, remove the old stock some distance away, and place the new hive in the position originally occupied by the stock. All the flying bees which constitute the swarm return to the old position, while a young queen is reared in the parent hive.

With the frame hive prevention of swarming is the chief aim of the bee-keeper. This is done by giving room in advance of the requirements of the bees by adding surplus chambers of shallow frames or sections. By this means surplus honey is obtained, instead of increase of stocks.

THE HIVE

Such insects as wasps, hornets, and humble bees are able to build an abode for themselves, the two former of a paper which they manufacture themselves, the latter from dried grass, moss, or similar material. Bees, on the other hand, are certainly able to clean their home, or, if it happens to be in a hollow tree that is decaying, by gnawing off the rotting wood, they may enlarge it if necessary. They can also make it better for living in by stopping up crevices, but they are unable to make it themselves.

In this country they need a home that will protect them from the inclement weather, as it is impossible for them to exist beyond the summer months out of doors. Occasionally we have colonies establishing themselves out of doors, on a bush or the under side of the large limb of a tree, where they thrive while the warm weather continues; but as soon as the chilly weather of the autumn comes the combs become brittle and break away from their attachment, falling to the ground, so the colony is destroyed. In India and America bees do remarkably well out of doors.

The most natural home of the bee is in the cavity of a hollow tree, which in size must not be less than one cubic foot, although

it is often much larger, have at least one narrow opening, and be protected against storm, rain, cold and heat, as well as against the natural enemies, which prey upon the stores of honey, the wax of the comb, the young larvæ, and even the bees themselves. The suitability of the dwelling depends upon the materials from which it is constructed.

Warmth is the chief necessity of bees and their brood, and is essential to their life. This indispensable warmth they are able to produce by a certain amount of exertion, and at the expense

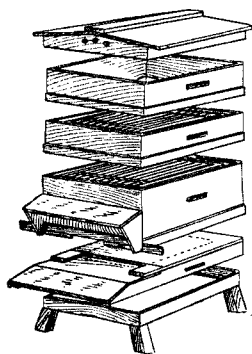


Fig. 8

of the food in the hive, so it must be kept in the hive as much as possible, which will only be the case if the walls are made of material that is a bad conductor of heat. Different substances, as is well known, show a very great difference in this respect. For instance, metals conduct heat very quickly, being good conductors of heat. If we place one end of an iron bar in the fire the end projecting will soon become so hot that it cannot be touched with the naked hand, and this though it has not come in actual contact with the fire at all. A metal plate heated on one side soon becomes hot on the other, while a board

may be burning on one side and be quite cold on the other, because wood is a much worse conductor of heat than iron.

Again, there is a great deal of difference between various kinds of wood with regard to their conducting qualities. The densest and heaviest woods conduct heat the quickest, while if the wood is light, porous, and spongy, it is a bad conductor, and the better will it retain heat. A beehive, then, should be made of wood, and the thicker the walls are, the more heat they will retain by keeping the air enclosed and free from contact with the outer air which is in motion.

The best and most up-to-date hive is that known as the W.B.C., as is shown in the illustration (fig. 8). It is named, as already indicated, after its inventor, Mr. W. Broughton Carr. This hive is



Photo Sport and General
EXAMINING THE COMBS SHOWING CLUSTER
OF BEES ON COMB



Photo Sport and General
USING THE HONEY EXTRACTOR FOR SEPARATING
THE HONEY FROM THE WAX CELLS

generally acknowledged to be the standard hive of British bee-keepers. Perhaps the outstanding advantage it possesses over the ordinary type of frame hive is the fact that the hive proper is surrounded by an outer case, which leaves a clear air space all round. In warm weather this space keeps the hive proper cool, while in winter the cold cutting winds are kept from the bees. It is a practice with some bee-keepers, when wintering down, to pack this space with cork dust, or other materials, such as chaff, but that is not required.

Beginning at the floorboard, it is nailed to two stout joists, running back to front. The joists are usually extended beyond the end of the floorboard and bevelled off downwards, across which the alighting board is fixed. Instead of the entrance to the hive being cut out of the body, the floorboard is sunk $\frac{1}{2}$ in. almost across its whole breadth. Making it thus permits the body boxes being solid, and if doubling is being carried on allows transfer of the chambers. A space is, of course, left between outer case and brood chamber, but this is filled up with a strip of wood which prevents the bees getting into the space between the outer case and inner body. This is called the tunnel-board. The brood chamber rests on the floorboard, and is 9 in. high. It holds ten standard frames and a division board.

Before proceeding further it will be necessary to describe the frames. The frames used are British Beekeepers' Association size, the dimensions of which are: top bar, 17 in.; bottom bar, 14 in.; total height of frame, $8\frac{1}{2}$ in., all these being outside measurements. There are many variations in the internal measurements of the standard frame, some makers sending out frames with thicker top bars, others stouter side bars, but all are uniform in outside dimensions.

Originally the top bar was $\frac{7}{8}$ in. wide and $\frac{3}{8}$ in. thick, side bars $\frac{7}{8}$ in. wide and $\frac{1}{4}$ in. thick, bottom bar $\frac{3}{8}$ in. wide and $\frac{1}{4}$ in. thick. The outside sizes must be uniform with original dimensions. The writer prefers to use frames having top bars $1\frac{1}{8}$ in. wide, with ends reduced to take the usual W.B.C. ends; the increased strength in the top does away with all sagging, and brace combs are reduced to a minimum. It is found that bees build their combs about $\frac{7}{8}$ in. thick, and leave about $\frac{3}{8}$ in. of a passage way between them as a general rule, although in combs containing honey only, as little as $\frac{1}{4}$ in. is left, so frames are spaced a shade under $1\frac{1}{2}$ in. apart. Many methods are used to secure this spacing, but the safest is to use

what are known as metal ends. Distance racks are a nuisance, and should be avoided. They cannot be used at the bottom of the frames as lateral movement is impossible. The most widely-used metal end is that known as the W.B.C. By its use frames are spaced $1\frac{3}{16}$ in. apart, but it is so constructed that if drone production is not desired alternate ends can be slipped back and the frames spaced $1\frac{1}{4}$ in. apart.

The outer portion of a hive consists of lower portion, known as outer case, lifts, and roof. The outer case is fitted with a porch which keeps the rain off the entrance. A groove is run along the bottom edge of the porch to form a gutter for the rain. Entrance slides are fitted to contract the entrance according to season and strength of bees. The outer case is 9 in. high, and fitted with plinths along the sides and back, which fit round the floorboard edges. The lifts are used when surplus chambers are on the hive, and are usually about 6 in. high. They are fitted with plinths all round.

The roof can be either a lean-to or gabled pattern, but should be perfectly weatherproof. Sometimes what is known as an eke is used with this hive. It is the same size as the brood chamber with the exception of depth, which is only 3 in. This can be used under a shallow frame super, thus converting it into a standard body box. In winter it is put under the body box to provide additional ventilation. In spring it can be removed and put over the body box, where it will be useful to keep the quilts neat, and conserve the heat so necessary for early brood raising.

All the parts of the hive should fit easy, tightness should not be tolerated; nothing makes bees so angry as sudden jerky motions about the hive. A tight-fitting roof removed with a jerk will upset a colony every time the hive is opened, so every part should be made so that there is a little play without leaving sufficient space that rain or robber bees can get inside. Hives should be painted a light stone colour with white roof, or all white, as this is the coolest in the hot sweltering summer days.

If hives are to have stands, the best pattern is that used with the W.B.C. hive. The frame is made to suit the different sizes of floorboard, and the legs are built into the corners in such a manner that they have an outward splay, the wood being bevelled when cut off. The advantage of having the stand separate from the floorboard is that if all hives are interchangeable, there is no trouble levelling them if any change in their location is required. It is imperative

that hives be as level as possible across the combs, as bees when comb-building form a natural plumb-line. If the frames are not put in this way, the advantage of using comb foundation is lost, as the combs will project at the bottom. If combs run from back to front of the hive, the front can be half an inch or so lower than the back, this will allow any moisture to run out; but if the combs are parallel to the entrance the hive should be sloped only very slightly to the front.

The frames, being 14 in. wide, require a body box $14\frac{1}{2}$ in. wide to accommodate them. This leaves a bee space of $\frac{1}{4}$ in. round the ends of the frames, so their depth being $8\frac{1}{2}$ in. make the body box 9 in. high. The sides of the body box which carries the frames are lowered $\frac{3}{8}$ in. to allow the frames to rest flush with the top of body box, and usually tin runners are fastened in. These are not so easily propolised by the bees as wood.

For the production of extracted honey, boxes of the same dimensions as the brood chamber are used, but shallow frames being used they are made 3 in. less in depth. *Shallow frame supers* contain either ten frames, with $1\frac{3}{8}$ -in. ends, or eight with what are called wide ends, 2 in. The use of wide ends is to save the bees having a large area of comb to seal over as the combs are drawn out deeper. Sometimes, however, in putting in frames with wide ends and fitted with foundation, the combs are drawn out irregularly. To prevent this they should, in the first instance, be put in with normal ends, and, after being filled and extracted, returned with wide ends. The combs will then be drawn out quite straight.

If comb honey is desired the W.B.C. section rack is the best to use. This is built like a shallow frame super, but containing seven frames, each holding three $4\frac{1}{4}$ -by- $4\frac{1}{4}$ -in. sections. The sections are held in by a small wedge at the end of each frame. Metal dividers between the sets of sections are provided to prevent the bees extending the combs beyond the woodwork of the section. The sections being contained in the frames are kept much cleaner and freer from propolis than in the ordinary section rack.

The cost of this rack is a little more than the ordinary one, this being its only drawback. The ordinary rack is a box having a slatted bottom to carry the sections, instead of them being fitted into a frame. The rack should be built out at the side, to make it the same size as the brood chamber or shallow frame super. The sections are kept in place by a following board and spring, both at the side and at one end. The usual rack does not have this built-

out space, and it cannot be used below the shallow frame box, therefore when put over the brood chamber a piece of quilting has to be used at the side over the frames to prevent the escape of the bees. It is all right to use where only sections are desired.

Another very useful hive is a single-walled one (fig. 9). Though not so comfortable to manipulate, it has the advantage of being a little cheaper than the kind already described. It consists of a floorboard, to which are attached the legs. Instead of a loose framework, as is the case with the W.B.C., the floorboard is sunken

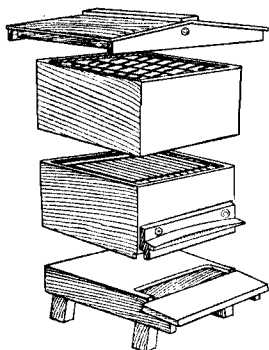


Fig. 9

at the front to give entrance, instead of it being cut in the brood chamber. The walls of the brood chamber on two sides and back are carried $\frac{1}{2}$ in. lower than the front, and so make a rebate which prevents the chamber slipping from the floorboard.

A lift is made about 1 ft. in depth, just a little larger than the brood chamber, so that it telescopes over it for the winter as far as the top of the porch, while a piece of $\frac{1}{2}$ -in. wood is nailed along the back of the hive in a line with the porch to keep the lift level, for if it tilts when put down it is very liable to wedge. Round the

inside of this lift, $\frac{1}{2}$ in. from the edge, are nailed strips of wood. When the lift is reversed they rest on the edge of the brood chamber, and so build the hive up to take the supers in the summertime. Another small lift to fit on the top, with plinths round, and a roof, complete the hive. In this case it will be seen that there is no dead air space at all. Other forms of hives might be described, but there is none which is superior, or even equal to the W.B.C., in so far as ventilation and comfort in working is concerned. There is no doubt that to make bee-keeping as profitable as possible it is advisable for the bee-keeper to make as many of the hives and appliances as possible himself. This, of course, applies to people who have plenty of spare time. Especially during the long winter evenings, time can be very profitably spent in the con-

struction of hives. All that is necessary is a few tools and brains. Material can be obtained for little or nothing in the form of packing-cases.

MANIPULATION OF BEES

One of the secrets of success in bee-keeping is being able to manipulate the bees without provoking them to use their sting. The bee-keeper should remember that constant manipulation, for no object whatever but to see how the bees are getting on, is injurious. Manipulate as little as possible compatible with proper management.

The points to be remembered are: proper subjugation, firm but gentle movements, no killing or crushing of bees, protection of the bee-keeper's person, climatic conditions, and proper method of handling the combs.

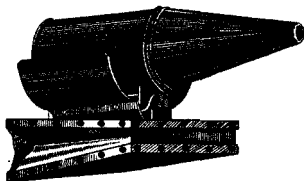


Fig. 10

Bees are brought under subjugation by causing them to fill themselves with food. When in this condition they are less likely to sting. When frightened the bees prepare for contingencies by gorging themselves with food. The smell from a cloth saturated with a weak solution of carbolic acid, or from smoke driven into the hive, has this effect. Smoke is the subjugator generally used, and it is applied by means of a smoker. The Bingham pattern (fig. 10) is the best. It consists of a pair of bellows, to which is attached a tin cylinder with a removable conical nozzle, which is open at the end. There is a connection at the back by means of which air passes from the bellows to and through the tin cylinder and out at the nozzle. Thick brown or corrugated paper rolled into a cartridge, fustian, or touchwood can be used as fuel, placed in the smoker with the lighted end downwards. The protection of the bee-keeper is carried out by means of a veil to cover the face. This should be made of a light mosquito netting, black in colour, so that it is easy to see through. Gloves should not be worn, as they make the fingers clumsy and cause rough handling, which the bees resent. They will also be a source of irritation to the bees each time they are

used, on account of the smell of formic acid remaining upon them after they have received the stings from the bees. This smell irritates the bees, and causes them to sting when otherwise they would be quite harmless. To give an idea of how to manipulate bees, a description of how to find the queen will not be out of place, and it gives the fundamental principles of all manipulations.

First choose the day and time. Never manipulate bees on cold wet days, or fine days with a keen wind blowing, or yet when it is thundery. Neither should it be done too late at night.

If done on the two first occasions mentioned the brood will be chilled. If in thundery weather, the bees are almost sure to be vicious. If done at night the bees are sluggish, and creep in amongst the clothes to seek warmth, so that when the garments press upon them they sting. In the daytime they fly freely, and, if they settle upon the manipulator, do not creep under the clothes, but fly off again.

Have everything ready. Take off the coat and turn back the shirt sleeves, or clip the sleeves of the coat tight round the wrist with sleeve-hooks or rubber bands. It is also advisable to clip the trousers bottoms to keep bees from going up. Put on the veil, seeing that it is properly arranged so that bees cannot get underneath. Light the smoker fuel and get it going properly. Go to the hive and blow

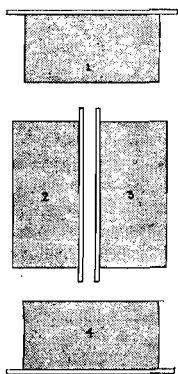


Fig. 11

a few puffs of smoke in at the entrance. Wait about a minute to give the bees time to gorge themselves, then take off the roof and lifts. Remove all the quilts except the calico one; turn back a corner of this with the left hand and blow a little smoke in between the combs from the smoker used in the right hand, gently stripping the quilt right off and using the smoker at the same time. Replace the quilt, and turn one side back so that the first frame is exposed. This is lifted up by the ears or lugs, and one side carefully examined. To obtain a view of the other side the comb should be reversed by four motions, as shown at fig. 11. In this way the comb is kept edgewise the whole of the time, and there is no fear of it becoming detached from and

falling out of the frame, which might happen on a warm day if the frames were turned flat. The comb is brought to its original position by a reversal of the motions and put quietly back into the hive, the next one being taken and examined in the same manner. When placed back, a second quilt should be used to cover those combs examined. This is drawn forward as each one is replaced, the combs not examined being kept covered with the other quilt, so keeping the bees warm and preventing them flying up too much.

At times it is difficult to see whether the queen is present owing to the bees clustering in large numbers on the face of the comb. These can be made to move by gently pressing upon them with the back of the index finger of the right hand. Never blow at bees to get them to move, as they object to the smell of human breath. Be careful not to crush a single bee during manipulation, for, as already pointed out, the smell of the poison from the crushed poison sac will infuriate the others.

The work and the manipulations required will be best understood by giving a brief outline of the work required during the year. The first operation is that of spring cleaning. This should be carried out as early as possible in April, and consists in scraping the tops of the frames clean from all propolis and pieces of brace comb, also cleaning the floorboard by lifting the brood chamber right off, scraping away the debris, and washing it down with a disinfectant. If several weak stocks are found, they should be made strong by uniting two together. This is done by getting the hives close together, moving them not more than one yard per day when the bees are flying. Then remove all combs from each not covered by bees, kill the worst queen, dust both lots of bees with ordinary wheaten flour, and interspace the combs in one hive, taking away the empty one. The flour will make all the bees smell alike, so that they will not fight, but amalgamate peaceably.

Those stocks which are short of stores should be supplied with food by means of a stimulative feeder, which should be continued until the fine weather arrives and the flowers bloom. During feeding the entrance to the hives should not be open more than $\frac{1}{2}$ in. The use of the division board in those hives where the bees are none too numerous will also be an advantage. By its means the heat of the hive is conserved by closing the bees on to just the number of combs they cover. As they get too numerous for these the division board is drawn back and other combs added, one at a time, until the whole ten are populated.

About May the hive will begin to be overcrowded, and if allowed to remain in this condition the bees will swarm. The modern bee-keeper tries to prevent this. As swarming is the result of overcrowding, the provision of more room, together with ventilation, will go a great way to keep the bees at home. A good indication that they require more room is when the bees elongate the cells just below the top bar. The new wax also gives them a very white appearance. Supers should be given at once, and ventilation given by propping up the front of the hive, or if it is very hot it may be blocked up in all round. A watch should be kept upon the bees, and as more room is required extra supers should be given by raising the full one and putting the empty one underneath. In June and July artificial swarms can be made if required, and the rearing of queens proceeded with. There are various methods of rearing queens. Perhaps the simplest one is to select the stock which has shown the best working qualities during the previous season. Allow it to reach swarming-point, and then divide it up into nuclei with a queen cell in each. A nucleus is a miniature colony of bees, and is made by having either small hives holding four frames (these can be made for a few pence, as they need not be substantial, only being required in warm weather) or full-sized hives with a division board. Into each hive is placed one comb of brood and two of food, the brood being in the centre, and about a pint of bees. These hives are put upon different stands, and provide means for the hatching out and the fertilization of a young queen in each. Therefore, providing the food combs, minus bees, are taken from other hives, the strong colony will make from eight to nine nuclei.

As the sections are completed they should be removed, and, if the honey flow is still on, replaced with new ones.

In August all honey should be removed from the hives. This is carried out by means of a clearing board and bee escape. It is best to get all the shallow combs off as quickly as possible so that all the extracting can be done at one time, so saving several sticky messes and the continual washing up of the appliances used. Store the supers in a warm room until all are removed from the hive.

First extract all the unsealed honey by putting them in the extractor before uncapping. This should be put in an open vessel in a warm room and left exposed, with the exception of a piece of muslin over the top to keep out dust, flies, wasps, &c. The excess-

sive moisture will evaporate and the honey be made fit to sell. If it is extracted with the bulk, it will make the lot of such a watery nature that fermentation will take place. Next grade the honey for colour into light, medium, and dark. If all those colours are present, this can easily be done by holding the combs up to the light. Extract and keep each colour separate, for in this way a better price is obtained than by the indiscriminate mixing which often takes place.

The extracting should be done in a warm room, as the honey leaves the cells much better when warm, and for the same reason it should take place as soon as possible after it has been removed from the hives. Care must be taken that the room is bee-proof, for when there is an absence of flowers the bees are soon attracted by the smell of honey, which, if they can get to it, even in very small quantities, excites and demoralizes them and causes robbing.

After the combs have been extracted they can be put back for cleaning, and it is best to put them on to those stocks which require food. The clearing board should be left on the brood chamber, with the metal slide slipped back from the extra hole which it covers. As the bees have access to the wet combs through this small hole only, they carry the honey from the wet combs below for storage near the brood. When the combs are dry they are freed from bees by pushing the metal slide over the hole, so that they must pass through the bee escape.

Those stocks which require food should now have it supplied by means of a slow feeder. This will induce the queen to lay, and plenty of young bees will be reared for wintering. Re-queening should be carried out where necessary. Kill the old queen, and when the stock has been queenless for at least twelve hours introduce the new one. This is done by caging her on one of the combs over food, with a few attendant bees to feed her. Bees recognize each other by smell, so the queen is put into any one of the *many introducing cages on the market, which provide for the scent of the hive entering through perforated zinc or wire cloth, but the workers of the hive cannot get to the queen, for if they did they would kill her.* At the end of twenty-four hours she is liberated, and will then be accepted, as she has become permeated with the scent of the hive.

In September, all those colonies which have not sufficient food for wintering, i.e. 30 lb. of food, or, in other words, eight combs well

filled and sealed, should have the requisite amount made up as quickly as possible by means of a rapid feeder.

In October all is quiet, and the bees can be wintered down.

During November, December, January, and February the bees should be left alone as much as possible. No undue excitement should be aroused, or the bees will consume more food than is good for them, and be attacked by dysentery. Beyond seeing that the candy supply is not exhausted, and that the entrance is not locked with dead bees, or that mice have not gained an entrance, the bees should be left entirely alone.

FEEDING OF BEES

Under the modern conditions of bee-keeping it is often necessary to feed bees. First, through the bees at times placing all the honey gathered in the supers and leaving the brood chamber with very little stored in it. Secondly, as it is possible to actually see the amount of food stored in the combs by them, being movable, instead of having to guess at the weight, which was the case under old-fashioned conditions. Many colonies can be saved by supplying a little extra food, which would otherwise perish. Food can be given at all seasons if necessary. In the early spring stimulative feeding is carried out by means of the regulation bottle feeder, or by giving about $\frac{1}{4}$ pt. of syrup every third night by means of a wide-necked jam jar, in which the food is placed, and a double thickness of muslin tied over the top. This is inserted over the feed-hole and the bees suck the syrup through. The food should be given at night, and should be new-milk warm. It is also made thin, as the bees require a lot of water in the spring for the rearing of brood, which is the object of slow feeding. If there is a continual slow supply of food coming in the queen lays more continuously. If the food is given too rapidly it does harm instead of good, as the bees store it in those cells which should be left for the queen to lay in. It is also harmful to feed if the bees have an abundant supply of food. In such a case it is only necessary to use the cappings of the food just round the brood nest for mulation.

Stimulative feeding is also carried out for about a week or ten days when swarms are hived to help them to build combs quickly. In those districts where there is a break between the honey flows, such as fruit and clover, it is often desirable to give stimulative

food for the production of combs ready for the second crop of honey. Again in the autumn those stocks which require food should have it given to them slowly, so that they rear more brood and store and seal some of it in the cells. At the end of September the full complement of food should be made up by means of rapid feeders. There are different forms of these, but the principle is the same in all, i.e. the bees are allowed free access to the syrup so that they can take it as rapidly as they desire, provision being made to prevent them from drowning. The syrup for rapid feeding and for slow feeding in the autumn is made thicker than that for the other periods of the year. It is to be stored and sealed over with as little water in it as possible, so that the danger of dysentery from the food is reduced to a minimum. The food given in the winter is candy, which is placed over the feed-hole in a glass-topped box, so that it is an easy matter to see when the candy is exhausted without disturbing the bees. The different foods are made as follows:—

SPRING AND SUMMER FOOD

White lump cane sugar	...	10 lb.
Water ... ..	...	7 pt.
Vinegar ... ..	...	1 oz.
Naphthol-beta solution	...	$\frac{1}{2}$ "
Salt ... ..	...	1 "

Place over a slow fire until all the sugar is dissolved.

AUTUMN FOOD

White lump cane sugar	...	10 lb.
Water ... ..	...	5 pt.
Vinegar ... ..	...	1 oz.
Naphthol-beta solution	...	$\frac{1}{2}$ "
Salt ... ..	...	$\frac{1}{2}$ "

Place over a slow fire until all the sugar is dissolved.

RECIPE FOR MAKING CANDY

Six lb. of refined cane sugar, 1 pt. of water, $\frac{1}{2}$ teaspoonful of cream of tartar, and $\frac{1}{4}$ oz. of salt. Stir until it comes to the boil, then draw the pan back so that it simmers gently for ten minutes. Remove from the fire and stir briskly until it begins to granulate, as it cools pour into a glass-topped box. Should the candy become burnt it would be unfit for bee food. •

WINTER MANAGEMENT

This consists of preparing the bees properly in the autumn and then leaving them alone as much as possible during the winter months.

In August re-queen where necessary, in September see that they have plenty of food; if not, feed rapidly. In October pack down for the winter. First put a couple of balls of naphthaline into the brood chamber, then give winter passages over the tops of the frames under the quilt by laying a couple of pieces of wood about $\frac{3}{4}$ in. thick at right angles to the frames. This will allow the clustering bees to pass over the top to other food combs in the winter, for curiously enough they will not go down and under in cold weather. If required, a cake of candy should be given. The top of the frames should be well covered with at least three thicknesses of good warm material. Newspapers folded neatly make a good packing, and some bee-keepers make a cushion of cork dust or chaff. The entrance to the hive should be open from 4 to 6 in. To prevent the roof blowing off a stake is driven down at one side of the hive to which a cord is tied and passed over the top. A brick is tied to the other end so that it just clears the ground; this will make the roof secure no matter how hard the wind blows. If snow falls it should be cleared from the alighting board, and the entrance shaded from the sun by rearing a board in front, or the reflection of the light from the snow will attract the bees out to their destruction by being chilled. A peep at the candy and the entrance raked clear about every month is all the attention now required.

HONEY

This is the sweet secretion of flowers collected by the bees and converted into honey. It is really a process of digestion, the cane sugar of nectar being converted into grape sugar of honey, which when taken into the system is all ready for assimilation and requires no digestion. This is the reason honey is such a valuable food and medicine for human beings, it can generally be taken by those people with whom ordinary sweets disagree, and does not cause decay of the teeth. It is sold in two forms: sections or comb honey, which are squares of wood $4\frac{1}{4}$ in. by $4\frac{1}{4}$ in., holding 1 lb.; or it is extracted from the comb and sold in jars or tins, quite free from wax.

PROPOLIS

This is a resinous substance gathered from the buds and limbs of trees, and is used for stopping up chinks and crevices, also for covering up anything objectionable which gets into the hive.

POLLEN

This is the fertilizing dust of flowers which become dusted upon the bee when gathering nectar. It is stored in the cells and mixed with wax, and used for sealing brood, also for making the pap or pyle food for feeding the young bees, queen, and drones. It is the starchy food of bees, forming muscle and tissues, while honey is the heat-giver.

BEES-WAX

This is made from honey. When the bees wish to make wax they fill themselves with food, then hang in festoons perfectly quiet in the hive for twenty-four hours. During this time the food taken into the stomach goes through a chemical change which converts it into oil. This percolates through small holes into eight small sacs or moulds on the under side of the abdomen, where it hardens into the form used by the bees in comb-building. It takes from 5 to 20 lb. of food to make 1 lb. of bees-wax. Wax is a valuable asset to the bee-keeper and should not be wasted. All combs, including the smallest pieces, should be saved and melted down. This is accomplished either by tying the comb in muslin and sinking it with a weight in soft water, which is then boiled—the wax is melted and rises to the top—and removed when cold; or by means of a solar wax extractor. The latter plan is the best, as by its means the aroma of the wax is preserved and the colour improved by bleaching, whereas with boiling a good deal of the aroma is lost and the wax is darkened in colour.

DISEASES OF BEES

Whatever outdoor pursuit is taken up, we very soon find that there are diseases and enemies connected with it. Improvement in cultivation apparently brings out new diseases, while those already known seem to get more virulent. Bees are no exception in the rule, and they are affected with various diseases and attacked by many enemies.

•

Diseases of bees are of two kinds, those which affect the brood, and those which affect the adult bees. Several of them are of a very infectious nature, and difficult to deal with on account of our inability to control the movements of the bees. Another difficulty which presents itself is the total ignorance of the majority of bee-keepers as to the healthiness or otherwise of their stocks, while again the carelessness and selfishness of many of those who do know often leads to the infection of the bees in a whole district.

At the present moment bee-keepers in Great Britain are outside the pale of legislation, while practically every other country in the world, including Ireland, realizing the importance of this minor industry, have protected it by restrictions in the matter of disease. Bee-keepers have tried for many years to induce the Government to give them the advantages afforded by protection possessed by their more fortunate brethren, but so far without success. Some little time ago, however, a Diseases of Bees Bill was brought before Parliament by the President of the Board of Agriculture (Mr. Runciman), and it is sincerely hoped that this means that bee-keepers are to obtain the legitimate Government assistance which they have long sought for. Not until this is secured will the people of this country be able to follow this calling with any measure of safety against those who are utterly indifferent to their responsibility or to the welfare of their fellow craftsmen.

Disease is often brought from other countries by the importation of bees and queens from infected districts. Another method of infection is by means of honey, which is imported in large quantities, and because it can be bought cheaply is sometimes thoughtlessly used by bee-keepers for feeding their stocks. This is no fancy picture, for the writer has seen this happen time and again. With proper legislation all this would be changed, and the bee-keeper would be protected against these dangers in the same way as the fruit-grower and farmer are protected at the present time. Very few of us perhaps like legislative interference, but of two evils those who keep bees on a large scale, and depend upon the returns made from them for a large portion of their income, would welcome the lesser one of Government protection of the majority against the minority.

Bee Paralysis

This is not very prevalent in this country. The symptoms are distension of the abdomen with a dull black appearance. The bees tremble or shake, and run about the alighting board in an excited manner, very often falling off on to the ground, where they very quickly die. The disease can often be cured by re-queening, or removal of the hive to the stand of a healthy stock, the bees of which very quickly turn out all the affected ones. It is of a contagious nature more than infectious.

Another method of treatment is by flowers of sulphur. This is dusted over the bees, which, by its action, makes the disease expend itself very quickly. After its use the bees are apparently worse, but gradually recover. The sulphur must not be allowed to go on to the brood, or it will be killed. Therefore for treatment it is better to make an artificial swarm of the bees, and give the brood to other stocks to hatch out. Care must be exercised to see that every bee receives treatment, and to this end they should be dusted late at night when all are clustering together.

Chilled Brood

This is a condition and not a disease, caused at times by the bee-keeper manipulating in cold or damp weather. At other times by contraction of the clustering bees, owing to cold in the spring after a spell of fine warm weather, during which the bees have extended the brood nest. By some it is confounded with foul brood, but there is a great deal of difference — one being death through disease, the other through exposure. At the same time, if there is foul brood in the neighbourhood the presence of chilled brood provides a good medium for the propagation of this disease. There is also a difference in the appearance of the brood. In the case of foul brood, the larvæ turn yellow and then brown; in chilled brood, they go grey and then black. While the bees will clear out chilled brood, they do not attempt to remove foul brood unless a disinfectant is used. If there are large patches of chilled brood it is much better to take out the combs, melt them down, and replace them with frames fitted with full sheets of foundation, as this saves a great deal of labour to the bees and removes a possible source of trouble.

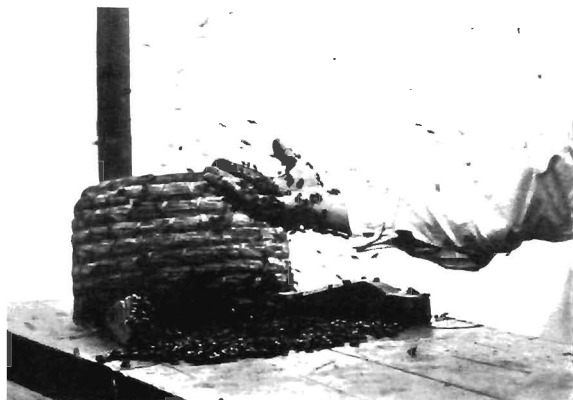
Dysentery

This is another disease which is generally caused by the carelessness or bad management of the bee-keeper. Damp hives, bad ventilation, and improper food result in this disease, which is recognized by the bees soiling the walls and combs inside the hive with their excreta, which are dark in colour. When healthy, the bees keep the interior of the hive spotlessly clean and never evacuate inside. Prevention of the two first causes are obvious, while the food problem is at times more difficult. The disease is found in the springtime of the year. If caused by food trouble, it means that the food they have been living upon in their semi-torpid condition during the winter has contained too much waste matter in the form of water. As bees fly at infrequent intervals during the winter for cleansing, it is necessary that their food should be of such a nature that there is very little waste matter, and therefore it should be as thick as possible. Bees should not be allowed to go into winter quarters with a lot of unsealed stores, whether it be honey or syrup. Food is ripened in the hive by evaporation of the excessive moisture, and until this is completed the bees will not seal it over. All unsealed stores should therefore be removed from the combs before packing down for the winter. Occasionally food of too watery a nature is sealed over by the bees. Also what is called honey dew, which is the excretion from the aphids, is collected. When this is the case, the trouble is beyond the control of the bee-keeper. As soon as signs of the disease are observed, remove all the combs not covered by bees; in their place combs containing ripe sealed food should be given. Change the bees into a clean hive and give clean quilts. If it is cold weather it will be necessary to remove the hive indoors to carry out this operation. The clean hive should be well warmed in front of a fire before the bees are put into it; also, if food combs are given, they should be placed in a warm room for a time. Failing sealed stores, then thick syrup should be made and fed to the bees. In the early months of the year they will refuse to take this, so it must be put into the combs. This can be done by laying the combs flat and pouring the syrup from a vessel which will allow a thin stream to pass, such as a teapot, from a height of about 2 ft. The food will then be driven into the cells, or a tin water-tight case, about 1 in. wider and deeper than the comb, may be used. The comb is placed in this, together with



PICKING OUT THE QUEEN BEE

Photo, Sport and General



A HANDFUL OF BEES

Photo, Sport and General

the syrup, and by vigorous shaking the cells will be filled. Another method is to feed the bees on warm freshly-made candy.

Foul Brood or Bee Pest

The most serious of these, which has been present in this country for many years, is Foul Brood, or, as it is now more correctly termed, Bee Pest. At first it was thought that only the brood was affected, hence the name Foul Brood. It was found later that the adult bees were also often affected, even the ovaries of the queen, hence the change in the name. Scientists have devoted a great deal of time to the study of the cause of this disease, and have been so successful that it is quite possible for those who take the trouble to effect a cure.

The disease is caused by a bacillus known as *Bacillus alvei*, which is a rod-shaped organism, and in this stage it may be compared to a plant, being soft and easily destroyed by various chemical agents. These rod-shaped bacilli propagate by division across the centre, the two halves then growing until they attain a certain length, when they again divide. These divisions take place at the rate of two per hour, so that it will be seen how rapidly the disease spreads when once the spore finds a suitable medium upon which to start into growth. After all the nutrient material upon which it lives is exhausted the bacillus turns into a spore, and in this stage it is difficult to deal with, as it is covered with a double-coated membrane, which renders it impervious to ordinary treatment by chemical reagents. The only safe method of destruction is by fire. The spore retains its vitality for an indefinite period, and may lie dormant and unsuspected in crevices of the hives and other appliances for years; hence the fallacy of buying second-hand appliances, which, though apparently cheap, may be dear even as a gift.

Reference to the diagrams published by the Board of Agriculture and Fisheries, here reproduced, will give an idea of the microbes described above. In diagram No. 12, left side, is seen through the microscope healthy juices of the larva, while on the right the disease is shown in its early stage; the rod-shaped bacilli are seen very clearly. Diagram No. 13 shows on the left side the disease more advanced, while the right illustrates how, after multiplication and exhaustion of the feeding material, the bacilli turn into spores.

There are two forms of the disease, one with an offensive smell,

which is very virulent, the other odourless, and more easily dealt with.

In the majority of cases indications of disease may be observed at the entrance to the hive. Instead of working with a vim, the bees creep about on the alighting board in a listless manner, also many will be seen fanning at the entrance. In the bad-smelling variety the odour can sometimes be perceived several feet away.

Upon examining an affected comb with the disease in its first stage, it will be noticed that instead of lying curled up at the base of the cell, immovable, and of a pearly-white colour, which is the case when healthy, many of the larvæ are moving as if uncomfort-

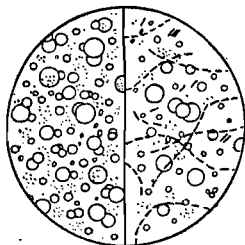


Fig. 12

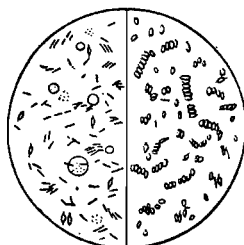


Fig. 13

able in the cell. Some will be back upwards. As the disease progresses the larvæ begin to change colour, turning yellow or buff, having a flaccid appearance and lying horizontally in the cells. Should the larva be attacked after it is sealed over, then instead of the cappings being slightly raised and mealy in appearance, they will be sunken, have a dark appearance almost like wet leather, and contain a number of irregular perforations. The cappings, instead of being in an even mass will be in patches, and the comb will have an unusual appearance. The sealed cells will be found to contain a dark-brown sticky mass, really the tracheæ of the larvæ which the bacilli have been unable to consume; eventually this mass dries up to a brown scale, containing millions of spores, which adheres to the side of the cell. The smell of the virulent form is like glue or size which has decomposed.

Another disease, known as Sour Brood, is classified by some scientists under the heading of Foul Brood. In this case the larva is

attacked when curled up in the cell, but instead of changing to the buff colour straight away, it first changes to a greyish colour and then goes yellow. There is a sour smell with it, very much resembling vinegar. Instead of a ropy mass in the cells it will be found that the remains of the larva can be withdrawn from the cell intact, i.e. they are enclosed in a sac formed by the chitinous covering. Sour Brood is usually found in combs affected with the virulent form of Foul Brood. On rare occasions it will be found unconnected with the last-named disease.

The sources of infection are: using contaminated honey, the use of hives and appliances without proper disinfection, by means of robber bees, by the bee-keeper's carelessness in not disinfecting himself properly after handling diseased bees before going to healthy ones, and also by leaving hives and combs exposed in which bees have died from disease. When there is a dearth of flowers the bees from healthy colonies are attracted by the smell of honey, upon which they feed, and so carry home the disease. This disease may also be caused by the interchange of combs from affected stocks to healthy ones. To guard against infection all stocks should be kept as strong as possible and be headed by young prolific queens. Weak stocks and those whose vitality has, from any cause, been lowered are more susceptible to attack. If an outbreak of disease occurs, no interchange of combs (even in the apparently healthy stocks) should take place for at least one season.

In all cases of disease the cheapest and most effective way of dealing with it is to cut the first loss, and destroy bees, combs, &c., straight away, restocking the hive with either a healthy colony or a swarm. While this is sound advice, there are some who prefer to cure the bees. Although the game is not worth the candle, this can be done by any of the following methods. Treatment should only be attempted when the stock is a strong one, and when it is only slightly affected. When the bees are weak in numbers and the combs in a putrid condition, destruction of the lot should take place at once.

In a mild case, i.e. when only a few cells are affected, cut out all the diseased cells with a sharp knife, and feed the stock on medicated syrup, using a disinfectant in the hive in the form of naphthaline balls; instead of the usual two, four may be placed in the brood chamber. Do not try dropping pure carbolic acid into the affected cells. This is a tedious and ineffective method. Cut out the disease and burn it.

If a good number of the larvæ are affected then more drastic treatment should be adopted. The work should be carried out as late in the evening as possible, to avoid robbing by other bees. Have ready a straw skep or well-ventilated box. Move the hive on one side, and put the box or skep in the position it occupied, propping up one edge about 3 in. to allow the bees plenty of room to enter. Take the combs one by one and brush off the bees in front of the box or skep. Do not shake the combs to dislodge the bees or the honey will be spilt, and afterwards picked up and carried home by healthy bees. When it is dark all the bees will have collected in the skep or box, and they should then be secured. If in a skep they can be fastened in by tying a piece of cheese strainer over the mouth. It is then carried indoors, and placed in a cool place, for preference a cellar, with the bottom upwards. If a box is used, then they can be secured by tacking a piece of perforated zinc over the mouth; it should also be placed in the cellar.

The bees are allowed to remain in confinement, without food for forty-eight hours, during which time all the food taken into their stomachs from the diseased combs will be exhausted, and any bees affected will die.

After the bees have been cleared from the combs they should be burnt at once. If there is a furnace near it is a simple matter to dump them into it, but if, as often happens, they have to be burnt in the open, the operation is more difficult. Combs should never be burnt on the top surface of the soil, as honey and wax will run over the ground. No matter how carefully this is dug over after, some of the honey is bound to be found by bees, which are attracted by the smell of the burnt honey and wax, and carried home. Dig a hole 3 ft. in diameter and 1 ft. deep, put straw in the centre, rear the combs up on end on this, putting on the top the quilts and debris from the hive. When lighted this will all burn, and when quite consumed the ashes are buried by filling in the hole.

Before using the hive again it will be necessary to disinfect it; this can be done by boiling it for an hour, or by scraping and washing it with pure carbolic acid. In both cases it will require some time to dry, and in the latter case, it should be exposed to the air to take off the smell, to which the bees object. The best method of disinfecting is to scorch the inside with a painter's blow-lamp. This destroys all spores. It also removes the propolis, and

the hive can be used again as soon as it is cool. Failing a lamp the hive can be painted inside with petrol or paraffin and lighted. When scorched the fire can be extinguished by smothering with a wet sack. It is also well to repaint the outside of the hive.

The period of confinement having expired, the bees are brought out and hived as a swarm into the clean hive on to frames fitted with full sheets of foundation, and fed with syrup medicated with naphthol-beta. It will be found that through being hungry the bees are sometimes angry, and sting the operator during the process of hiving. To avoid this, and also to get a dose of medicine taken quickly, they should be fed before being liberated. This is done by making $\frac{1}{2}$ pt. of thin medicated syrup, which is put in a wide-necked jam jar, over the top of which is tied a double thickness of muslin. This is inverted over the cheese cloth or perforated zinc, when the bees suck the food through. This will put them in a good temper, so that they can be hived without difficulty. After hiving, the skep or box in which the bees have been treated must be burnt together with the diseased bees which have died.

With this treatment it will be found occasionally that the disease will break out again in a very short time, owing to the fact that, as already stated, at times the ovaries of the queen are affected. To make quite sure of the cure, it is advisable to requeen with a healthy fertile queen; or failing this, insert into the hive, into which the treated bees are to be put, a newly-built comb containing eggs from a healthy stock, and, as the bees run in, catch and kill the queen, so that they rear another queen from the eggs provided.

Another method of treatment, which does not involve the destruction of combs or any part of the interior of the hive, is by means of formaldehyde. This can be obtained from the chemist in a 40-per-cent solution, which should be reduced to 10 per cent by the addition of 3 parts of water to 1 of formaldehyde. Tack on the back of the division board a piece of flannel or sponge, and saturate this every week with $1\frac{1}{2}$ oz. of the 10-per-cent solution, taking care to keep in the brood chamber four balls of naphthaline. These should be placed inside the brood chamber as far away from the entrance as possible, and split in half, so that, having a flat side, it is impossible for the bees to roll them out. Under ordinary circumstances two balls are sufficient, but in treating disease more are required. Continue the treatment for some time after the

disease has apparently disappeared, as the gas given off will kill the bacilli but not the spores; therefore it is necessary to go on until all the latter have broken into life and are killed.

Another method of treatment is by means of "apicure". This is sold by all appliance-makers, and is in the form of a tablet. It was invented for those who have little time to spare and those who do not like much trouble. It is only necessary to drop two of the tablets and two balls of naphthaline into the brood chamber of the hive every fortnight or three weeks in the summer time, and every three months in winter.

If the stock is badly infected and weak in bees it is not worth while trying to cure the disease, but total destruction should be carried out at once. This should be done carefully in order to ensure every single bee being killed, for if any escape they will enter healthy stocks and carry the disease with them. The method of destruction by burning sulphur is not a safe one. This is done by smearing brown paper with sulphur, digging a hole in the ground, in the centre of which is pushed a cleft stick to hold the paper clear from the ground so that it will burn. At night, when all the bees are at home, the sulphur paper is lighted, and the hive lifted bodily from the floorboard and placed over the brimstone pit, so that the fumes rise in amongst the combs and suffocate the bees. The difficulty is, that some of the bees remain on the floorboard, and these escape, with the result indicated above.

The most effectual method of destruction is to use cyanide of potassium. The drawback in the use of this substance is that, as it is a deadly poison, carelessness in its use may cause trouble. A small piece of cyanide, about $\frac{1}{2}$ in. in diameter, is sufficient to destroy a colony of bees or a wasps' nest. This should be dissolved in 1 oz. of water. Go to the stock to be destroyed during the day and see that the quilts fit neatly, so that the fumes cannot escape. Close the entrance to about 1 in. Wait until the evening when all the bees are at home, then place a shovel full of soil at the entrance and pad it down solidly. Take off the roof, turn back a corner of the quilt ever so little and pour in the solution. Cover down, put the bottle which contained the cyanide on the ground and smash it, so that there will be no danger of its being used again. Allow the hive to stand for a quarter of an hour, when all the bees will be dead. Combs, quilts, and dead bees can then be burnt, and the hive disinfected as previously described.*

If there are several weak stocks badly affected, then the bees

might be united and starved, after brushing from the combs, and so made into a strong lot.

The bee-keeper must also take care to disinfect both himself and the appliances after dealing with disease of any kind. First remove all the propolis from the hands by means of methylated spirit. Being non-solvent in water and of a very adhesive nature it is possible for spores to remain in the pores of the skin under its shelter, although the hands are washed in a strong disinfectant. Having done this, wash the hands in the following solution: Calvert's No. 5 carbolic acid 1 oz., water 12 oz. Izal and formaldehyde may also be used. A very powerful and the most efficacious disinfectant is mercuric chloride, which, on account of its dangerous nature, is not usually recommended; in the hands of careful people it is the simplest and best to use. It is manufactured by Burroughs & Welcome, and sold in tabloid form. All that is necessary is to dissolve one tabloid in 1 pt. of hot water and immerse the hands and appliances which have been used, then wash clean with soap and water. Soap must not be used with the mercuric chloride or the alkali will render it non-effective. The danger lies in getting the poison into the mouth. Cuts and wounds do not matter, as it is an antiseptic. The finger nails should be well cleaned and scrubbed with a brush, and the clothes sprayed with the carbolic solution; or better still, an overall which can be washed should be used.

Isle of Wight Disease

This is so called because it was first noticed in that island in 1904, from which it spread to the mainland, where it has caused great loss to bee-keepers. The disease was apparently a new one, and therefore its dangerous nature was not realized until it had worked considerable havoc amongst the bees. Even now, although bacteriologists at Cambridge have been working on it for some considerable time, very little definite knowledge has been obtained. The disease is of an epidemic nature, and was present in America a few years ago, where it gradually died out. There is no doubt that the disease has been present for a much longer period than is generally supposed, the protozoon called *Nosema apis*, which is the cause of this disease, being found in healthy bees. Various names besides Isle of Wight Disease have been given to it, one being Malignant Dysentery, because in some cases the bees show

all the signs of dysentery, soiling the combs and the interior of the hive. It is now called *Microsporidiosis*.

The disease is of a contagious nature, and if a stock is attacked it is doomed, there being no known cure. The microbe which causes it multiplies in the chyle stomach of the bee, and eventually turns into spores, large numbers of which can be seen by means of the microscope in the stomachs of affected bees. In the first stages of the disease it will be noticed that the bees suddenly become listless. They often crowd on the alighting board, giving the impression that they are overcrowded and preparing for swarming. A number of the bees erect the abdomen and rub it with their hind legs as if in pain. Some of them fly a little way and return to the hive; eventually they lose the power of flight and drop from the alighting board to the ground, where they creep along, giving short hops or jumps in their endeavour to rise on the wing. They ascend twigs, posts, blades of grass, or anything standing upright, from which they attempt to fly, collect in small clusters on the ground, and eventually die. The abdomen is distended, and as a rule the posterior pair of wings is found to be dislocated and standing out at right angles from the body. If pressure is applied to the abdomen it will discharge a mass of undigested pollen, varying in consistency from liquid to that of thick porridge, and in colour, from very light yellow to dark-brown or black. The bees will be found creeping many yards away from the hive, which is in a number of cases found to be denuded of inhabitants, the combs, with an abundance of food and brood, being forsaken. Very often the queen is found alone alive in the hive.

It will also be found in many cases that the bees evacuate inside the hive, and also on the alighting board and in front of the hive, not just in an odd spot or two but all over. The writer has seen the alighting board $\frac{3}{8}$ in. deep with excretion.

If the bees die in the winter the excretion is generally absent, the bees being found dead in a mass on the floorboard, although the combs have an abundance of food in them. The brood is never affected; the queen and drones very rarely.

As there is no known cure, the bees should, upon the slightest sign of the disease, be killed, and the combs, &c., destroyed as described for Foul Brood. The hive should be scorched out with a painter's blow-lamp, and washed and painted outside before using again. All dead bees should be swept up and burnt, the

ground sprinkled with quicklime, and dug over. If bees are going to be kept again it is better to put the hives on fresh ground.

The disease is spread by contagion, the drinking-place being a fruitful source. In the early spring drinking fountains should be put out, so that the bees will locate and continue to use them instead of going to ponds or pools of water over which there is no control. These fountains should be washed and disinfected twice per week; also a supply of salt should always be placed in the drinking water and in the syrup given to the bees in the early spring and autumn.

Care should be taken by those living in unaffected districts not to purchase bees from an affected area, while those in affected areas should purchase bees required in that district, as those which remain alive are more likely to be immune, whereas if bees are brought from a healthy district they quickly develop the malady.

May Pest

This resembles very much both paralysis and Isle of Wight disease. It usually appears in May or June when the weather turns cold after a warm spell. The bees drop to the ground and run about, going up blades of grass, from which they attempt to fly, but fail, dropping again to the ground, where towards evening they collect in small clusters and perish. It attacks both the old and the young bees. The disease is caused by improper food, such as pollen damaged by rain and frost. Also bad food, such as beet sugar, being fed to the bees. Even after this has been discontinued for several weeks before an outbreak it may be the cause of the trouble, by setting up fermentation. In all cases of disease the following disinfectants may be used:—

Formaldehyde, 10-per-cent solution made as follows: commercial formaldehyde, 1 oz.; water, 3 oz.

Carbolic solution for disinfecting the ground round the hives: Calvert's No. 5 carbolic, 1 oz.; water, 2 qt.

Carbolic solution for painting hives: Calvert's No. 5 carbolic, 1 part; water, 2 parts.

Carbolic solution for disinfecting clothing: Calvert's No. 5 carbolic acid, 1 oz.; water, 12 oz.

Mercuric chloride for washing the hands, spraying clothing, or washing hives: one tabloid in 1 pt. of water.

Apicure, two tablets in the brood chamber every fortnight in the summer, and every three months or so in the winter.

Izal may be used as prescribed on the bottles.

Medicine.—Naphthol-beta solution. Take an 8-oz. bottle marked in $\frac{1}{2}$ oz., i.e. sixteen marks, into which place 1 oz. of naphthol-beta, and half-fill it with methylated spirit, or sweet spirits of nitre. Shake well until it is all dissolved, then fill up to the fourteenth mark. One division, i.e. a tablespoonful for each 10 lb. of sugar, for syrup or candy; or an easy method of measuring for small quantities is, as much naphthol-beta as can be heaped on a threepenny piece for each pound of sugar. This can be dissolved in a teaspoonful of either spirit.

ENEMIES OF BEES

Ants

Ants are very troublesome, especially when feeding bees. They enter the hives and carry off sweets in the form of syrup and honey. Powdered naphthaline in the hive under the lugs of the frames will banish them. It is also a practice with some to stand the legs of hives in saucers containing paraffin or turpentine. Painting the legs of hives with creosote will also prevent them ascending.

Birds

The most injurious birds, in so far as bees are concerned, are the Great Tit and the Red-backed Shrike or Butcher Bird. The former eats a great many during the winter months when food is scarce. They are attracted to the hive by the dead bodies cast out on fine days, when the bees take cleansing flights, and clear out those that have died. When these are exhausted, and upon cold days when the bees are not flying, it obtains supplies by tapping on the front of the hive. The noise attracts the sentinels, which, coming out of the entrance to find out the cause, are immediately snapped up and carried away to be eaten. The Tit generally has a favourite perch for feeding, to which it flies, and after carefully extracting the sting the bee is swallowed. On the perch will be found hundreds of extracted stings. Trapping or shooting is the best means of preventing loss from them, but those who have any qualms about killing may cover the entrance to the hives with either wire or herring netting. The Butcher Bird causes great

havoc on account of its delight in killing for the mere love of the thing. It also has the peculiar habit of making a larder near its nest, by impaling its victims on the thorns of a bush. These consist of frogs, beetles, young birds and bees, which it consumes at its leisure. They build their nests in the vicinity of hives to be near an abundant supply of food. The writer has shot as many as twenty-three of these birds in an hour in his own apiary. This is the only effectual way of preventing their depredations. Other birds which eat bees are Sparrows, Swallows, Whitethroats, and even the Robin; but with the exception of the Sparrow, which will eat a great many bees, very little harm is done.

The Green Woodpecker is another culprit which does a great deal of damage in wooded districts, especially during a hard frost, and it is no unusual thing for it to gain entrance to the hive by making a hole through the solid wood; even $\frac{3}{4}$ -in. deal is no deterrent, while it will tear straw hives all to pieces to get at the contents. Again, the only prevention is to shoot the culprits.

Braula Cœca

or, as it is commonly called, the Blind Louse, is a small parasite which lives upon the body of the bee. It is reddish brown in colour, and it adheres very tenaciously to the body of the bee, owing to its peculiar sucker-like feet. It can also move very rapidly. The life-history is a very peculiar one; as the eggs hatch inside the creature, the pupæ are extruded on to the floorboard of the hive, from which, in a fortnight, emerges the perfect insect. The young remain on the floorboard until they get the opportunity of attaching themselves to a passing bee. These creatures irritate the bee very much, often driving them frantic in their endeavour to free themselves from the pest. They are very partial to the queen, and collect in large quantities upon her body in the autumn, as many as twenty-five having been found on one queen.

It was thought at one time that they could not survive our winters, but it is now found that they can do so. It is more prevalent in the southern part of the country, where, during the past few years, it has increased tremendously. It is of foreign origin, and the only method of eradication is by strong fumigation with tobacco. The tobacco smoke should be driven into the hive, which after a few minutes should be lifted from the floorboard and the latter brushed down to remove the bodies. It should then

be washed with a 10-per-cent solution of formaldehyde. An easy method of freeing the body of the queen from their presence—and this should be done, or it is difficult for her to carry on the work of ovipositing—is to place her in a small box, into which tobacco smoke is driven. In putting back the queen it is necessary at times to cage her, or she may be balled owing to the scent of tobacco remaining upon her.

Earwigs

These will get into the hive, eat the honey, and make a disgusting mess with their excreta. Having wings and being nocturnal, they get into the hive very readily. Powdered naphthaline, used as for ants, is the most effective remedy. In the bee-house I have found earwigs useful for clearing pollen-clogged combs. These should be stacked together inside the house where earwigs will have access to them, and in a very short time they will eat all the pollen from the cells.

Hedgehogs

These also eat a number of bees, but they are not numerous enough to be of any importance.

Mice

Mice will get into the hive if the entrance is too deep. This should never exceed $\frac{3}{8}$ in. In the summertime there is not much rear of them attacking the hives. Late autumn and winter are the times when they may do a great deal of harm by entering the hives and eating both comb and honey. The bees being partially dormant, cluster in one portion of the hive, leaving some of the combs unoccupied, and it is upon these that the mice feed, often going so far as to build their nest where the combs have been eaten away. The bees are robbed of food which should be available in the early spring, and so die of starvation. If, in the winter or early spring, small pieces of wax and debris are noticed on the alighting board close to the entrance to the hive, an examination should at once be made, which will, no doubt, reveal the presence of mice. A faulty entrance may be remedied by using wire netting with $\frac{1}{4}$ -in. mesh.

Slugs and Snails

These creatures also get into the hive. The former eat a few bees, but the latter only give trouble to the bees, as they fasten them to the floorboard with propolis. Mice also give trouble in this way if they enter the hive when the bees are active, as they are then killed. A portion of the flesh is removed, and when the body begins to give off an offensive smell it is coated with propolis.

Spiders

These should be prevented from spinning their webs near to, or on, the hives, or many bees will be entangled. They are a source of danger to virgin queens taking their wedding flight.

Toads

Toads do a great deal of harm, and as they work so silently they are very rarely suspected, but they are responsible for the disappearance of thousands of bees. Making their abode in a hole near the hives, when all is quiet they come out and sit patiently in front until a bee flies within range of their long tongue, which is coated with a sticky secretion, to which the bee adheres, and is immediately swallowed. They, like the wasp, feed upon fallen bees. An extended alighting board will save many bees from being killed by wasps or toads, as although they cannot fly they are able to creep by its means into safety within the hive.

Wasps

These are very troublesome at times. They not only enter the hive and carry away honey and larvæ, but they attack the adult bees, which through exhaustion in carrying home heavy loads of nectar fail to reach the alighting board and fall to the ground. These are killed by wasps, cut up, and carried home to feed their young, the wasp being carnivorous. The prevention consists in the destruction of all queen wasps seen in the spring and autumn, also nests which may be found. This can be done by pouring in a solution of cyanide of potassium as previously described. Gas tar or paraffin can also be poured into their nest at night, and the hole blocked up with a sod of earth. •The bees are better able

to defend their home against attack if the entrance is narrowed to about an inch. The bee is no match for the wasp, which is more pugnacious.

Some bee-keepers use bottles filled with sweetened beer placed near the hives. While many wasps are killed by drowning in this, it is a source of attraction. When all the bottles are filled with dead wasps, they are forsaken and the hives attacked; therefore it is inadvisable to use these traps.

Wax Moth

The bee has a number of enemies, which prey upon the adult or the young in the cells, the combs, or the food. The most injurious is the Wax Moth, of which there are two varieties: the large *Galleria cereana*, and the small *Achroia grissella*. The large one is the most harmful. This insect is nocturnal, i.e. night-flying, at which time it is an easy matter for it to enter the hive, where it deposits its eggs in a niche or crevice. These hatch out into tiny grubs or worms, which live upon the debris at the bottom of the hive for a short time, and then creep up to the combs, where they live upon the wax, pollen, and brood. The grub burrows its way through the combs, where it is secure from attack by the bees. It takes it three weeks to attain maturity, and during that time it does a great deal of damage. It attains a length of 1 to 1½ in. At the end of three weeks it spins a cocoon, becomes a chrysalis, and eventually emerges as a perfect moth to perpetuate the species.

When the bees are weak in numbers the wax moth will often exterminate them altogether. Their presence is denoted by the tunnelling of the combs, and also by their excrement, which has the appearance of gunpowder grains. They also spin a silky web-like material by means of which they bind all the combs together. In bad cases the grubs will actually eat into the woodwork of the hives. Strong colonies can defend themselves against attack. Naphthaline or apicure will kill the moth if kept in the hive. Empty combs, whether in hives or stored away, should be protected against attack, care being taken not to let them rest against each other. In so doing a good refuge for the grubs is provided. It is also inadvisable to use split top frames, as the saw-cut provides a good home for the grub. Care should be taken to kill every grub seen, and if it is known that the wax moth is present

the quilts should be pressed with a very hot flat-iron early in the spring to destroy the eggs.

The small moth does little harm, as it lives chiefly upon the debris on the floorboard of the hive. It is a nuisance on account of the mess it makes by its excrement. In size and colour it is very like the ordinary clothes moth.

Other Bees

Last, but not least, we have under certain conditions to contend with the bees themselves. Though held up to us as an example of industry, the bee is one of the greatest thieves known, and when there is an absence of food they will go on the prowl, and steal sweets from any available source. They will even go so far as to attack and kill weak colonies, and carry home their food.

Robbing is indicated by unusual excitement in and around the hive. The bees fly round in large numbers, and fighting takes place on the alighting board; there will also be many dead and dying bees on the ground in front of the hive. Prevention is better than cure, therefore no sweets, such as honey or syrup, should be left about. Care should also be taken in manipulation not to keep the hives open too long, and to carry out all work in the evening.

If robbing does commence, then it can be stopped by rearing a piece of glass in front of the hive, from the porch to the alighting board, so that the robbers cannot dash in. The bees belonging to the hive will find their way round the ends. Another method is to put straw or hay loosely over the entrance and sprinkle it with a weak solution of carbolic acid. The entrance should also be narrowed so that only one bee at a time can pass through. This will enable the inhabitants to defend their home against the raiders.

CHAPTER II

GOATS AND THEIR MANAGEMENT

By H. S. HOLMES-PEGLER

Goat-keeping has made enormous strides in this as in other countries in the last thirty or forty years. In the early 'seventies these animals were kept mostly by cottage folks on or near commons, where the humble goat, like the ass, was sent to get its own living. A few also were owned by persons of a similar class residing at seaside resorts, who added to their income in summer by using the goat for draught purposes. It is only since the establishment of the British Goat Society, in 1879, that the breeding of this useful animal has been taken in hand by people with means, and thus in a position to lay out capital in improving the stock of the country and introducing superior specimens as milkers from abroad.

It is a singular fact that this work has been conducted chiefly and most successfully by ladies, who indeed constitute the bulk of the members of the society referred to, from the late Baroness Burdett-Coutts, who was patron of the institution at its inauguration, to Her Excellency the Marchioness of Aberdeen, who has also held the position of president. The goat is commonly called the "poor man's cow", but in these days it is less patronized by the actual cottager or artisan than by those who belong to a higher station in life and are the owners of small holdings. With these people three or four goats take the place of a cow, and they possess the further advantage that they supply, according to their number, the needful quantity of milk for use in its natural state, without requiring any portion to be made into butter or cheese, both troublesome and sometimes unremunerative processes. Then again, the cost of keep is much less, no pasturage is required, no extra labour, and if a goat dies the financial loss is small compared to that resulting on the death of a cow. At the same time, whilst the original outlay is on a much smaller scale all that

can be done with cow's milk can be carried out with goat's milk, and in some respects to better advantage.

BREEDS OF GOATS

In writing of the various breeds of goats it would be of no avail to describe specimens that are never seen in this country. This work is intended as a practical guide to the small farmer or small-holder, and therefore I propose to deal only with those breeds that we now possess, or are likely to have in the near future.¹

Most of the goats in England are of the common kind that is met with, under slight modification, all over Europe; but this common kind may be divided into two—the short-haired and the long-haired. The former, in these islands, are generally called "English" and the latter "Irish", as it is chiefly in the sister isle that these abound to any extent, long-haired goats finding but little favour in England. The Irish goat is often seen in English towns in small herds accompanied by an itinerant drover, who travels through the various counties during the summer months, visiting our markets and fairs, where he disposes of his stock to the uninitiated at prices which are often out of proportion to the merits of the animals he sells. This goat, in addition to being long-haired has unusually long horns, and the shape of these differs somewhat from those in the English breed. Besides being long and pointed, they rise very often almost perpendicularly from the head and then bend slightly outwards and backwards. The ears are small and pricked, the head and neck slender, and the body somewhat gaunt. Many of these goats are quite heavy milkers, yielding sometimes from 2 to 3 qt. a day for a period; but their lactation is of short duration, as those that kid in the spring are usually dry by the autumn.

The English Goat

What is generally regarded as the English goat is of a somewhat different build from that above described, but it varies greatly through repeated crossings in the past with foreign breeds, which were introduced many years ago when there was no restriction against importation, as is the case at the present day. Generally this goat may be described as follows:—Head neat and tapering, and

¹ This remark has reference to anticipated importations from Switzerland.

furnished usually with a beard in both male and female; the facial line is slightly concave, and the frontal bone prominent. When there are horns they incline backwards and then branch outwards. The ears are more or less erect, but often assume a horizontal position. Hair short generally, but always longer on the thighs and sometimes on the back. This applies to the she-goat. The male has longer hair, particularly at the chest and hind quarters. He has also a fuller beard.

The colour varies from white to black, and a mixture of these with brown. A large number of goats are to be met of a black-and-tan colour with white markings, small black horns, and more or less drooping or broken ears. These show crossings with Indian varieties, many specimens of which, some thirty or forty years ago, were landed at the London docks, having been used to supply milk on board steamers. On being mated to the common English goat, these produced an improved type, from which many of the goats now known as Anglo-Nubian (to be presently described) were descended.

Goats of the above description are met with chiefly on commons and railway banks, but are rarely or never seen at shows and hardly pay to rear. As I am writing for business people who want goats that will sell and be profitable, I would advise them to take up some of the breeds I am now about to describe.

The Anglo-Nubian

This is a variety that has many admirers, and one which, if the right strain be procured, commands high prices. Although not unknown forty years ago it had not become popular until patronized by the late Baroness Burdett-Coutts, whose famous herd was composed almost entirely of this breed and won numerous prizes. The Holly Lodge strain was indeed much sought after, but it came to the hammer at the death of Lady Burdett-Coutts, when its members were dispersed all over the United Kingdom, though one or two of the descendants are still kept by Mr. Burdett-Coutts at Holly Lodge, Highgate. One of the largest herds of Anglo-Nubians in the past was that of Mr. B. Ravenscroft, when living at the Noke, St. Albans; but these also have been sold and distributed to many parts, the chief supporters of the breed at present being Mr. Sam. Woodiwiss, of

Great Waltham, Essex, in the south, and Mr. and Mrs. Reginald Pease, of Sadberge Hall, Middleton St. George, in the north. The Anglo-Nubian may be said to be the aristocrat among goats. It is of large size, with long, wide, drooping ears, a short coat, generally of a rich tan or bay colour with black points. The horns are, or should be, rather small, somewhat flat-shaped with a slight twist, inclining to the rear, in some specimens lying close to the head. The face is strongly arched from the frontal bone to the muzzle, which is very small, with sunken nostrils, and having the lower jaw projecting somewhat beyond the upper. The neck is long and slender, the legs being also somewhat long in proportion to the body.

As a milker this breed is better than the common goat, but not equal to the Toggenburg or "Swiss". On the other hand, the milk is richer in butter-fat. The yield of one of these should not be less than 2 qt. in full profit.

Although made up originally from crossing the common goat with the Indian or Nubian, this variety is now regarded as an established breed, and has a section to itself in the British Goat Society's Herd Book. The following are the conditions governing entry into the Anglo-Nubian section as amended to date:—

1. When both sire and dam are entered in this section.
2. When one parent is so entered, and the other is in the Nubian section.
3. When three of its grandparents are so entered, and the fourth does not in its pedigree show any foreign breed, unless it be Nubian, for at least four generations.

Swiss Goats

The home of the milch goat, *par excellence*, is undoubtedly Switzerland, for there this animal has been specially bred for milk production probably for centuries, and the best milking breeds are imported therefrom. At least four distinct kinds are to be seen in Switzerland, but I have only to deal here with two, because only these are known in England and one of them but partially.

The breed that is most popular is the Toggenburg, a rather small variety, but an abundant milker, with the advantage of being exceedingly docile and affectionate^s in disposition. The only objection to be raised against it is, that on the point of hardiness it

is somewhat deficient, for it does not stand our damp climate as well as the Anglo-Nubian. It might be supposed that in Switzerland, the cold being greater and more prolonged than in England, this goat would do well with us, but in its native land the Toggenburg is housed in winter in warm quarters, generally with cows, and only sent to the mountain pastures after all signs of cold has disappeared. This is the only breed which has a distinctive colour and markings, if we except such as are white entirely. This colour is a light drab with certain parts white or at most grey, and these markings must be always present for a specimen to be pure. The most conspicuous and important of these are the white streaks or bands on each side of the face from the base of the ears, which are white inside, and more or less fringed with hair of the same colour down to the muzzle, also white at the extremity. There must be similarly a white mark on each side of the tail, which is likewise mixed with grey or white. On the legs, from the hoofs to just above or below the knees or hocks and on the inside of the thighs, the same grey or white prevails. This breed is supposed to be hornless, as indeed are nearly all Toggenburgs in Switzerland, simply because, should a horned specimen be born, as occasionally happens, it is generally slaughtered or at least not bred from. In England the Toggenburg is too scarce and expensive for such treatment, so a considerable number of horned Toggenburgs are met with. Where horns occur they are small and pointed, curving gracefully over the back of the head but not branching outwards. In its own country the Toggenburg is met with often carrying a long coat, but in England this is not countenanced. Here the coat should be short, and fine in quality. There is often a fringe of long hair along the back and long tufts of it at the thighs or buttocks, but these are not desirable and are being bred out as far as possible. The ears must always be pricked though pointing forwards with a tendency to take a nearly horizontal position at times, but never in the least degree pendent, which always indicates Eastern blood. There are indeed often goats which pass for Toggenburgs in which marks of this foreign blood may be traced. Another very common fault, which also indicates a cross at no very remote period, is the chocolate colour of the goat instead of the true light drab.

As a milker, among pure breeds, the Toggenburg can scarcely be excelled—many give 2 qt. a day for some considerable time after they have kidded, and 3 qt. is by no means

uncommon. Its great merit, however, lies in the length of time it continues in profit, some specimens being difficult to dry off before the next kids arrive. On this account there is a great demand for the Toggenburg both in England and the United States, hence it fetches always high prices. As a result spurious specimens are often offered for sale, so that it behoves the novice to be careful in making purchases, and to see that any goat offered as a Toggenburg complies with the above description. As a further guide, it should be stated that practically all pure Toggenburgs are entered in the Toggenburg section of the British Goat Society's Herd Book, the numbers in which are always accompanied, as a prefix, by the letter "T". Buyers, therefore, should insist on the Herd Book number being quoted whenever a pure Toggenburg is offered for sale.

The next breed in importance amongst Swiss varieties is the Saanen or Gessenay, and though it cannot be said that there are absolutely pure specimens at this moment in England, there are some that might pass for such, and there is every reason to believe that whenever the sought-for permit from the Board of Agriculture to import fresh blood from Switzerland is granted many Saanens will be included in the consignment, hence its mention here. This breed is considerably larger than the Toggenburg or the common goat, and some males in England which, though not strictly pure, show the features of the breed in a prominent manner, are amongst the largest goats we possess. The Saanen is remarkable for being always white or at most cream-coloured, and for having a long body and more or less long hair, especially the males. This breed also is regarded in Switzerland as hornless, though in its own country one occasionally is found having horns. The style of head and ears bears a strong resemblance to the Toggenburg, of which it is said to be the prototype, at least in part. Both male and female carry a beard, that appendage in the male being of considerable length. There is also a fringe of long hair on the ridge of the back, and the coat is invariably heavier at the hind quarters. The male has in addition a tuft of hair on the forehead.

In this breed, as also in the Toggenburg, two tassel-like appendages adorn the neck, the origin of which is not explained by naturalists.

In comparing the Saanen with the Toggenburg, Peer, an American writer, who visited Switzerland for the purpose of obtain-

ing specimens, wrote: "My observations lead me to say that, as a family, there are probably more large milkers among the Toggenburgs than among the Saanens, but that the best of the Saanen goats are superior to the best Toggenburgs. In other words, taking a given number of each breed as they come, I would expect the Toggenburgs to show the largest total yield; but among the best of each breed I would expect the Saanen to win." We in England have not had sufficient experience of the latter kind to be able to draw a fair comparison.

Cross-bred Goats

There is yet another variety of goat which is assuming popularity in England, a composite breed known by the general term "Swiss", those above mentioned being referred to under their local names as given.

A "Swiss" goat with us means one that is neither pure Toggenburg nor pure Saanen, though it may have a dash of Alpine, but it must have nothing of the Anglo-Nubian or the common goat in its pedigree. It will be observed that I have here used another term, "Alpine", and, as goats have been imported to England under that name, I should explain that there is a goat common to the Alps, which is neither Toggenburg nor Saanen, and quite different also from two other distinct kinds, known as the *Chamoisée* (so called by the French), and the *Schwarzhal* or *Black Neck*. The *Alpine* is a nondescript of various colours, but those imported into England under that name were black with white markings of a uniform character. These were purchased at the Paris Goat Show of 1903, where they were classed as "Alpines", but said to be of a particular variety known as the "Sundgau". I feel it necessary to mention this variety of goat here, because not only were several brought to this country at the date mentioned under a special permit from the Board of Agriculture and Fisheries, but they turned out excellent milkers, one in particular, named *Sedgemere Faith*, being the heaviest milker known to that date. As a good many "Swiss" goats of the present day are descended from these so-called Alpines, and especially from *Sedgemere Faith*, who figures largely in pedigrees, this reference seems necessary.

"Swiss" goats, therefore, in the technical sense, are goats bred in the manner described, but they have no definite colour, though

their shape and form and even markings correspond to the Toggenburg. Their chief merit is the large quantity of milk they almost invariably yield. Particulars on this point will be given in a later chapter. The principal breeders are Mr. Sam. Woodiwiss, of Great Waltham, Essex, with whom this variety originated, Mrs. Handley Spicer of Chobham, and Mrs. J. C. Straker of Hexham.

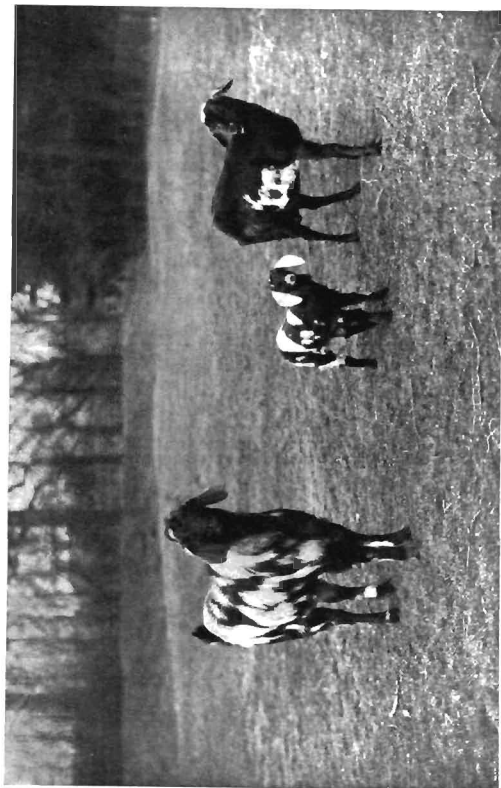
SELECTION OF A BREED

One of the first questions asked by a new-comer in goat culture is, "What is the best breed to go in for?" Now, if utility is the one object apart from appearance, I should certainly say the "Swiss", as here referred to, or the Anglo-Swiss, which is a cross between the best breeds as regards quantity of milk, and the crossing has always been carried out with the view to milk production. Probably every specimen can trace milking prize-winners in its pedigree. The next best cross to this would be the Anglo-Nubian-Swiss, which means further crossings with goats having "milking" blood in their veins, being generally that of animals which have made themselves conspicuous at shows as milkers. The Anglo-Swiss has now received recognition from the British Goat Society in so far as its pedigree is concerned, and the following definition is that officially given to qualify it for competition in the "Swiss or Anglo-Swiss" class: "A goat bred from English and any recognized breed or breeds of Swiss goats without any admixture of Anglo-Nubian or other blood for at least six generations on both sides".

If appearance is the chief point to be considered and utility a secondary matter (which is seldom the case), or again, if price is an important matter, the Anglo-Nubian will answer the purpose well. With these there is a much greater choice, and it is not necessary to require that they be entered in the Anglo-Nubian section unless what are called *pure* Anglo-Nubians are desired. Here greater care is necessary in tracing the pedigree to goats that have at no distant period made their name at the milk pail, and very few such goats are at present in the Anglo-Nubian section.

CONDITIONS SUITABLE FOR GOAT-KEEPING

The chief recommendation for goat-keeping is the facility with which goats may be accommodated, whilst the same benefits are derived in a small way as those obtained from dairy stock on



84 ANGLO-NUBIAN GOATS, "SHAMROCK OF CASTLEMILK" AND "RIDING ROSANNE", WITH KID
Photo Skipper, Harvard College

the larger scale. In the first place pasturage, though an advantage in some cases, is by no means necessary, and unless it be extensive, is an absolute disadvantage, for goats kept long on the same grass without a change of herbage in time contract disease and die off. The goat, indeed, in spite of its propensity to roam, accommodates itself readily to the stall-feeding system, and given the run of a yard, will often do better stall-fed than one that is pastured. In many instances goats are kept to advantage without even this yard; but a garden is almost a *sine qua non* if this animal is to be maintained economically. Hence a mere shed—if nothing better is available—and a vegetable garden will enable anyone to keep a goat or a couple; and it is advisable to have two for various reasons. In the first place the supply of milk for a household can be continued for a longer period, providing that the two come in profit at different times; and secondly they do better in company, being sociable animals, whilst the trouble of feeding and milking is not much more for two than for one.

THE GOAT HOUSE

Although I mention a mere shed as sufficient in an emergency to start with, most people who keep goats require something more pretentious after a short time, and prefer to build a proper goat house. I should therefore give here some particulars in the way of needful accommodation, as much for the sake of the goat-keeper as for the goat itself.

I may remark that in many houses in the country there is a disused stable or cowhouse or some outbuilding that, with very little arrangement of the interior, can be adapted to the wants of a goat. A needful accommodation is a raised bench, 3 ft. long by 2 ft. wide, which can be used for the goat to lie on, or on which it may stand to be milked. For this last purpose some such structure is most necessary.

Goats have a great dislike to damp in any form, and will always prefer a plain board or two at a short elevation from the floor to the most inviting bed of straw or other litter on the ground. A hay rack is the next necessity, and here two important points should be observed. Goats are wasteful creatures in their food if they have facilities given them for being so, and they can destroy almost as much hay as a pony will eat if the hay rack is not suitably constructed to counteract this. With this object the bars of the hay

rack must be placed $1\frac{1}{2}$ in. apart, and the rack itself, if the goat is loose, should be raised to such a height from the ground that the animal has to stand on its hind legs to reach the contents. When this is not done it pulls hay through the bars in its endeavour to select the choicest morsels, and tramples on it.

GOAT STALLS

Where several goats are kept together it is not advisable to let them be loose in a stable, as they are very apt to fight, when the weakest fails to get its share of provender. In such cases miniature stalls should be provided, and in place of a manger—which should never be used under any circumstances, as food accumulates and turns bad in it—a deal board 11 in. wide should be supplied with a circular hole cut of such a size as to let a small pail down to about level with the brim. This pail should be of the largest size of those sold at the seaside for the use of children on the sands. The partitions of the stalls need not extend to the full length of the goat, but only enough to keep it from reaching its neighbour's food, or from fighting. Their width is also important, and should not exceed 2 ft. 3 in. Again, the chain which keeps the goat fastened up should be quite short — not exceeding 10 in., including the spring hooks, one of which should be attached to the ring on the goat's collar, the other into an iron rod fixed vertically midway between the two partitions, the ring of the chain sliding up and down this rod. These measurements are important, being given with a view to preventing the goat from turning round in its stall and soiling its feeding pail. If a couple of goats only are kept it is a good plan to have the entrance door and gangway in the middle and the stalls ranged against the wall on either side. The floors of these stalls can be raised some 18 in. or so from the ground, so that each is a little stable in itself. When this arrangement is provided the hay racks are placed at a convenient height over the feeding board to be reached by the goat standing in its usual attitude. Some people provide two pails, one for food and the other for water, but it is not desirable to have a water pail at all, as the hay is constantly dropping into it. Water can be offered as required, as goats are not great drinkers if they have much green fodder.

ADVANTAGE OF COMMONS

One very favourable condition for goat-keeping is the proximity of a common, with common rights attached to the residence, provided the soil is not too wet, as is so often the case with waste land. Here an abundance of fodder is provided with the short herbage, and the gorse or furze that abounds thereon, besides such feeding-stuff as brambles, much of which is available the whole year round. The objections are that goats have generally to be tethered, unless in constant charge of an attendant, also that they are liable to attack by mischievous boys and by dogs. Besides this, the tethering pins do not get moved often enough when the animals are any distance away from their home.

LOOSE BOXES AND STABLES

Goats require plenty of light and air when kept stall-fed. For this reason an old-fashioned stable, with a small window high up through which no sun enters, is not a very good place for them, especially if it faces north. On the other hand, a loose box in a well-ventilated stable, where sunshine can enter, especially if a horse is kept under the same roof, makes capital accommodation. Goats like company, and will generally fraternize with other animals, especially horses and cows. There is a very common idea, both in this country and abroad, that both horses and cows are healthier in the company of a goat. Veterinary surgeons scoff at this, and say there is nothing in it, but the fact remains that the practice is very general both in England and abroad. Certain it is that cows pastured with a goat are seldom or never subject to abortion. Whether this be on account of the goat eating something deleterious in the herbage which produces the trouble, as some suggest, or whether from some other and unknown cause, I am unable to state.

FEEDING AND CARE OF GOATS

Goats are not always the hardy animals that they are popularly supposed to be, and this is greatly on account of the way they are fed. It is with these as with other stock—or, indeed, with the human subject—the more highly they are fed the more liable they are to disease. In the hands of the breeder for exhibition the goat

has to be well supplied with a constant change of food of the most nourishing character, to obtain a rapid growth and to secure a heavy yield of milk, but many such goats die every year, whereas those that are less pampered with corn and cake, and have to get their own living to a great extent by pasturing and browsing, are seldom sick. It is but reasonable, however, if a goat has to give milk in abnormal quantity, that it should be fed differently from animals in their natural state.

GARDEN PRODUCE AS FOOD

As I am writing chiefly for the benefit of people who keep goats to supply themselves and families with milk, and to do this on the most economical system possible, I am not recommending an expensive dietary. Goats are capable of utilizing and transforming into splendid milk a quantity of material that would in most cases be wasted. I refer here to garden produce chiefly, though the kitchen can also furnish some portion of the rations, such as dried crusts of bread and peelings of vegetables used for the table, or even remnants of porridge and cooked potatoes.

Amongst the garden refuse may be mentioned the haulm of potatoes and peas, the latter being stored and given dry, also clippings of trees with the leaves on, which makes capital food in autumn. Again, there are ivy clippings, and to some extent cut grass, providing it be given absolutely fresh, and has not been trampled on before being cut. Soiled grass no goats will touch—they will almost starve first. The tops or leaves of vegetables like carrots, parsnips, and Jerusalem artichoke, many actual weeds, such as brambles, thistles, dandelions, docks, tansy, &c., are all available as food. Acorns and horse-chestnuts are also consumed. The former are well liked, but must be given sparingly, owing to their astringent qualities; but the latter are not always eaten.

Goats are particularly fond of barking trees, as many a novice has found to his cost. This may be turned to good account by throwing in a yard a quantity of fresh-cut branches when trees are pruned or lopped; also brushwood from the clippings of hedges, and such waste stuff, all of which costs little more than what is charged for carting it to the spot.

The garden provides most of the material in the way of green fodder during summer and autumn, but during winter and early spring this has often to be bought. After Christmas swedes and

mangels may be procured in most country places, and though the goat-keeper has to give a higher price for these roots than the farmer who buys in large quantities, it pays him well to do it. Small potatoes, called "chats", being the "throw-outs" from the marketable supplies, can also be purchased cheaply, and, if well washed, are readily consumed.

It is stated by travellers who have met with these animals at Malta and in Italy that goats there eat garbage in the way of green stuff. If that is so, it must be because the poor creatures are driven to it from sheer starvation, for in England, Switzerland, France, and Belgium, goats have the character of being most particular in the freshness and cleanliness of their food, and will not touch dirty or decaying vegetables. Those who tend these animals should be careful, therefore, to see that every root and leaf is thoroughly washed free from all dirt, otherwise much waste will result.

DRY FOOD

In moderate quantity hay and corn, especially the latter, must form part of the daily rations to maintain the milk supply, and also as a change from green food. The best form of grain is good sound oats, given crushed or whole, according to the appetite of the animal. Voracious feeders should have the crushed and others the whole grain, which latter, however, all goats prefer. It may or may not be mixed with bran. When the oats are given crushed it is a good plan to add some bran, but when they are whole goats will often disperse and waste the bran in their efforts to pick out the oats. Observation should be made of the habits and peculiarities of the different individuals, and they should be treated accordingly. Indian corn or maize may be given occasionally but sparingly, as it is less digestible than oats, and if partaken of in too large quantity may cause stomach disorders.

Linseed cake is good for those that require feeding up, but otherwise only as an occasional luxury. Some goats are very fond of it, whilst others will hardly touch it. It all depends on how they have been reared. I have known Irish goats that subsisted entirely on commons refuse to eat even oats when not accustomed to this food.

The guiding principle in feeding goats to get a good yield of milk is to give as great a change as possible. As these animals chew the cud they require to have as much as is necessary to

fill the stomach, and then to be left quiet for a time to masticate and digest it.

RATIONS

As to the number of meals, if the goat owner looks after his animals himself, I would recommend him to give four meals a day, beginning at 7 in the morning, continuing at 11 and 4, and finishing at 7 or 8 in the evening. This is on the understanding that the goats are being stall-fed and not pastured. When goats are on grass all day they only require a feed of corn and a little hay when being milked in the morning and another at night, the corn being given with bran while the milking is going on, and the hay afterwards. This dry food counteracts any tendency to over-looseness of the bowels consequent upon much fresh grass being taken into the stomach.

PASTURAGE AND TETHERING

All goats have a strong propensity for wandering and getting into mischief, and seem to take a fiendish delight in doing damage, therefore they can seldom be allowed loose, and must accordingly be tethered. The only exception is when, say, a couple of goats are out at pasture with cows and have been accustomed to this kind of life from the first. Then they keep to their bovine friends, and strange to say, do little or no harm to the fences. When many goats are loose by themselves, on the contrary, there are always some ready to lead others astray, and these will discover the smallest opening in a hedge and make their way through it on the chance of finding something to their liking on the other side, when the rest of the herd will at once follow. The worst of tethering is that the tether has to be moved two or three times a day, and if rain should fall the animals need to be brought in under cover, as most goats have a great dislike to being left out in rough weather, and will run round their tether bleating and pulling to get free. This they often succeed in doing, coming home with their tethering pin dragging behind them.

The pin should therefore be strong and of sufficient length to go some 18 in. into the ground, with the head only just above the level, otherwise the chain is apt to get twisted by the circular movements of the animal, till the latter is at last brought close up to its tethering pin and unable to get food. Some 12, or at most 14 ft., are sufficient for the length of chain, and it is important that

this be furnished with a swivel at each end, provided with a spring hook to connect the chain with the collar of the goat at one end, and at the other with a springless hook to fasten the chain to the tethering pin. This hook has the form of a double shackle, and may be bought at most ironmongers. It cannot possibly come undone, as often happens with the spring hook, in which, when dirt accumulates, the spring is prevented from acting and the chain becomes detached.

It is not advisable to pasture goats after the middle of October nor before quite the middle of March. This applies particularly to the tethering system, for then the animals are exposed to cold winds and inclement weather generally, which is not only detrimental to health, but seriously affects the milk yield. If the food consumed is required to maintain bodily heat, it must necessarily leave less for transformation into milk. Goats always contract diarrhœa when put on fresh grass too early in the year, so this change from stall feeding must be done gradually from an hour or so a day at first, being gradually extended as the stomach accustoms itself to the change of diet. It is also injurious when a goat is partly stall-fed to turn it out in the early morning before the dew is off the grass. When goats are out day and night they get hardened to this kind of thing, but this treatment cannot safely be accorded to superior milch stock of the kind I have recommended, however well it may be adapted to the common sorts.

WATER AND SALT

When goats are on pasture they rarely drink water except in very hot, dry weather. It should be offered to them once or twice a day, however, and also when stall-fed in the stable. The water must be given in a perfectly clean bucket and be quite fresh. In winter it should just have the chill off. Salt is a necessary adjunct to food. Goats delight in licking a lump of rock salt, and should therefore always have access to it.

COST OF FEEDING A GOAT

As I propose to show that goats are profitable animals to keep, I shall give here the estimated cost of food all the year round. Of course it will be understood that opinions may differ on this point, for much depends on circumstances, and also on the amount of

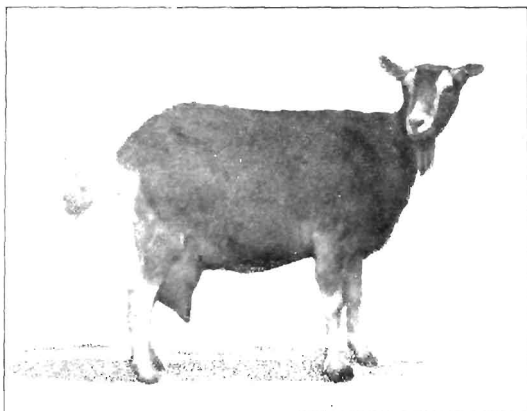
care bestowed as well as on the economy exercised. According to my own experience, the daily outlay, where a goat is entirely stall-fed and all food has to be bought, varies from $2\frac{1}{2}d.$ to $3d.$, according to market prices, and also according to the time of year. Where there are garden supplies less material has to be bought; but assuming there is no garden, and estimating hay at £4 a load and roots at £1 per ton, I make the hay come to about $1d.$ for the 2 lb. provided, and the oats and bran to $\frac{3}{4}d.$, being given in two large handfuls, and weighing, the former $\frac{1}{4}$ lb. and the latter 2 oz. Add to this the roots in the form of mangels or swedes, and weighing about 9 lb., which will cost roughly another $1d.$, and we get the total, $2\frac{3}{4}d.$ Where there is a garden this latter item will be less, for if waste garden stuff takes the place of roots the cost may be reduced to $2d.$ a day. Anything beyond this, such as oil-cake, is not absolutely necessary, and comes under the category of luxuries.

In summer stall feeding such as that just described will only have to be resorted to on wet days, assuming that pasturage is available in fine weather. A goat can then be kept for from $6d.$ to $9d.$ a week. When these animals are put out to graze the usual charge is $6d.$ a week, and I believe six or seven goats are considered equal to one cow as regards the consumption of grass.

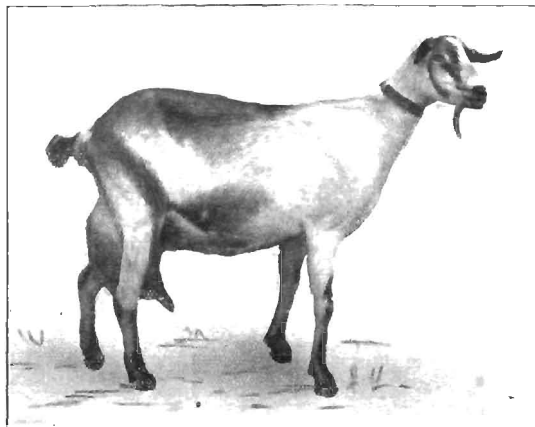
Goats can always be maintained at less expense if the owner feeds them himself than if they are left to a servant, for he soon learns to ration them according to their respective appetites, and to be particular in only giving just enough, especially in the way of hay, to be cleared up at a meal. Servants on the contrary will often fill the hay rack unnecessarily, and put food into a goat's pail before it is emptied of its contents from the last meal, which is bad for the goat as well as for the owner, for it gives the animal a distaste for its food and much is then wasted. I have heard people complain of the cost of keep of a goat under these circumstances, saying it eats as much hay as a horse. This is of course impossible, but it will waste nearly half as much as a horse would eat if given to it recklessly.

GROOMING AND HOOF PARING

Part of the care of a goat consists in regular grooming and paring the hoofs. A well-groomed goat not only presents a much better appearance to the eye, but is undoubtedly healthier and



MILKING GOAT — "COWSLIP III"



ANGLO-NUBIAN GOAT — "WIGMORE TOISY"

(By permission of The British Goat Society.)



probably happier, for it is not continually being subject to irritation of the skin caused by vermin in its coat. When a horned goat is ungroomed it will be noticed to be frequently rubbing its skin in places with the tip of one of its horns, a sure indication of the presence of lice. The friction on the skin promoted by the frequent use of the dandy brush quickens the circulation of the blood and promotes health.

The paring of the hoofs is also an all-important function, for unless seen to at least once a month the horny matter grows to excessive length and curls up under the frog or sole of the foot, causing the goat to walk lame. As dirt and manure collect here it is apt to produce foot-rot, and should therefore be scraped out when the paring is done, if this has been long neglected. Treating the hoof with occasional smearings of Stockholm tar keeps it in a cleanly and sanitary condition.

BREEDING

A goat may breed twice in a year, but this is unusual and hardly desirable, being a severe strain on the system. These animals nearly always drop their kids from February to May, coming in season from September to December or even in January, and carrying their young five calendar months, and sometimes a few days over. It is not very uncommon for kids to be born in June and even July, but in the next four months this very rarely happens. I was amused to see recently, in a journal devoted to smallholders, the following editorial advice given to an enquirer who wanted to know how to arrange the mating of two goats to get a regular supply of milk all the year round. He was calmly told to mate one in June and the other in September, to kid in November and February respectively, with the naive alternative, that in case he should find a difficulty in inducing a June mating he could "get over it by the purchasing of a November kidding animal". This is so unusual an occurrence that I took the trouble to look through the list of the dates of birth of kids as entered in the Kid Register of the British Goat Society for the previous fifteen months, and I did not find one that had been born in either September, October, or November out of 538 entries. Indeed, anybody who could so far subvert nature as to cause goats in any number to breed during these months would make a small fortune, for I am every year inundated with applications for such animals

when it is next to impossible to obtain them. A few kids are born in December and still a few more in January, after which they appear more frequently as stated above.

As a number of people are every year being taken advantage of by unprincipled dealers who sell goats at high prices on the assumption that they are due to kid during the four latter months of the year, I would urge those of my readers who are novices in such matters on no account to part with their money until the goats offered have actually kidded and then they will be safe.

CHOICE OF THE STUD GOAT

Half the success of goat-keeping depends on the choice of a suitable stud goat, that is if the kids are to be reared for sale or kept for future stock. The explanation is that whilst common kids with no pedigree have but little demand, those bred from good milkers and mated to not merely "pedigree" males, but such as are descended from proved and preferably prize milkers, are in good demand and fetch high prices.

Here I should mention that a goat that has won a milking prize at an officially recognized show is entitled to the affix of a star (*), and if its daughter gains a similar honour the latter has an additional star, and so on. Now, if one of these goats is mated to a male whose dam has a similar qualification, being likewise a "star milker", as she is called, that male is distinguished by the prefix of the dagger sign (†) to its name, showing at a glance its milking pedigree and probable capability of begetting exceptional milkers by transmitting the attribute it has inherited from its parents. Such kids, as I have said, sell well, and therefore, although it may mean a stud fee of a guinea, perhaps, this is more than repaid if the kids turn out to be "nannies" and in a less degree if they should be "billies".

A list is published every year by the British Goat Society, usually in August, of the stud goats that have been accepted on the Stud Goat Register, such goats being selected, in consequence of their breeding, as suitable for getting superior milking stock. Copies of this Register Circular may be had by non-members at the price of 2d.

Considering that it costs no more to rear a kid from a registered male than one from any nondescript animal, it will be realized that there is a decided advantage for anyone who wishes to build up

a strain of milkers to go to a little expense at first by making use of this register.

AGE FOR MATING

It is a somewhat disputed point as to the age for mating a young goat. There is no question but that, if size is required, the goatling¹ should not be put to the male before she is quite eighteen months old, so that she will be nearly two years old at her first kidding. In other words a kid born in March or April, as most kids are, should be mated during September or October of the year following. This is better for the produce as it is also for the parent than when, as not infrequently happens, the latter gets served in December or January following the month of birth. In such cases the kids are born in May and June, when the dam has not attained her full size, and when the best part of the year has passed during which the kids make their quickest growth. It must be remembered that the sooner kids make their appearance after the turn of the year the better it is for their development, as they have the whole of the spring and summer before them. Kids that come into the world in July or August, on the contrary, make slow progress during the following autumn and winter.

Goats breed at a very early age. It is not uncommon to find a kid pregnant when only four or five months old, and the male is able to get stock at the same age, and indeed whilst still sucking its dam. I have often heard people express surprise at their goat being in kid when there has been no male, as they suppose, on the premises capable of serving her. They do not take into consideration the fact that her own male kid was running with her for three months or so, which at once explains the mystery. Good stock is often begotten by kids of six or seven months old, but I prefer to use one that has at least turned a year. The awkward part is that, as most kids are born in the spring, if we wait until they are over twelve months old much time will be lost, as by the time one has reached that age there will be scarcely a goat in season for him to serve. Hence it follows that they are mostly brought to stud at eight or nine months, or at eighteen or nineteen months old.

¹ A word introduced by the British Goat Society to describe a goat over one year and not over two years old.

TREATMENT OF GOATS KIDDING

When the period of gestation has expired, which is usually at about five calendar months from the date of service, the she goat should be closely watched for signs of approaching parturition. At this stage the udder, which has been gradually increasing in size for a fortnight or more, becomes hard and distended, the abdomen drops, the pelvis expands, and the vulva enlarges and reddens. The animal shows great restlessness, uttering plaintive bleatings. She should be then freed from her fastenings and preferably placed in a loose box by herself. The kids are generally born within a few hours after these symptoms have been manifested; but if after that time the animal shows distress and appears to be in much pain there is probably something wrong, and a veterinary surgeon should be called in to see her. This, however, seldom happens, and the kids generally make their appearance of their own accord sooner or later.

Once in the world the kid that is strong and healthy is soon on its legs making its way to the teats of the goat, who at once commences to clean it by licking it. If the goat appears to have an abundance of milk before or just after the kid is born, a portion may be gently drawn to ease her, but nothing like all. A further milking may take place a few hours later; but always at this stage leaving in the bag more than enough for the young.

REARING KIDS

Where the milk supply of a goat is much required for household use, it is doubtful whether it pays to rear her kids. As regards the males it certainly does not, and the females only when the dam is an exceptional milker. If one considers the value of milk consumed by one of these youngsters by the time it is weaned, it will be found to have cost something between 12s. and 15s., and when to this is added the trouble and worry, the noise when separated from the dam, and the fact that few offers exceed 10s. for a nanny kid (when someone is willing to buy it), it will be admitted that the view as expressed above is justified.

On the other hand, a long experience has shown me how difficult it is to overcome the desire to keep these interesting and pretty little creatures running with the dam. If the owner of the goat has sufficient strength of mind to sentence them to summary

execution at birth on his own account, it becomes almost impossible to turn a deaf ear to the appeals of his family, who are sure to beg for their lives being spared, and to offer to bring them up by hand. This may be easily done if begun at a quite early age, but later it is more difficult. An ordinary infant's bottle with a fixed teat may be used for this purpose and answers admirably, provided that it is kept as sweet and clean as if used for a child. Another important condition is that the kid is never fed to repletion—never given, in fact, as much as it will take, for in that case it is sure to get "scours", or, in other words, diarrhœa, and this is sometimes difficult to cure. The milk should be supplied at the proper milk temperature, being neither too hot nor too cold, and goats' milk should be given for the first six weeks at least—afterwards cows' milk can be substituted by degrees if desired.

For the first three days it is well to let the kids suck in order to have the benefit of the biesting, or first milk, which is especially adapted to the wants of the newly-born, whilst unsuitable for domestic consumption. After this it is better to milk the goat regularly and completely, and to feed the kids with it from the bottle, than to let the latter remain by the side of their dam taking what milk they like until the time comes for weaning them. This system is practised on dairy farms with cows, and what applies with advantage to the larger animal is equally applicable to the smaller.

The advantages of this plan are these: In the first place, the goat does not fret after her young so much if she has only had them with her a few days; and secondly, by being milked at regular intervals, twice or thrice a day, the yield is encouraged more than it is when the milk is drawn at all times and in small quantities as done by the kids. Nature only provides milk for the purpose of nourishing and rearing the young, and as these grow and begin to make use of their teeth, requiring daily less milk for their sustenance, the natural supply diminishes so that if it is not drawn artificially the goat has a tendency to go dry. As regards the kids the advantage of the system I advocate is still more apparent. These are not necessarily restricted to the quantity of milk the dam is capable of supplying—always assuming that one or two other goats are in milk at the same time, and that the kids that are being reared have a portion of this milk as well as that of their own dams. After two or three months milk can be replaced by something cheaper, such as linseed tea, oatmeal gruel, or the milk substitutes advertised for calf feeding. I have reared many kids on

a mixture of oatmeal, pea meal, and linseed meal made into gruel, and this can go on indefinitely until the kid absolutely declines to take such food, and by that time it no longer requires it. The only objection to this hand system of feeding is the trouble it gives, and so but few practise it, preferring to leave the kids and dam together. This may continue for six or eight weeks, by which time the kids may be weaned from the dam entirely, and then other trouble begins. There are few noises more irritating to the nerves than the continual bleating of a kid after removal from its dam, and the louder plaints of the latter on missing her offspring and hearing its cries. It is advisable, therefore, to place them, if possible, sufficiently far apart that they do not hear each other, but this with most goat-keepers is no easy matter.

Kids require plenty of milk if they are to attain any size, but they will generally begin making use of their teeth by the time they are a month old. Bits of hay may then be given them, and when they are six weeks old some crushed oats. Exercise is also a necessary adjunct to their wellbeing, and they should be allowed their freedom as long as possible, for it is a shame to tether a young kid, though this becomes a necessity if there is garden ground adjacent where they can do damage. In such cases if kids are reared at all it should be quite away from the place of birth.

HERMAPHRODITE KIDS

These correspond to what are known as "Freemartins" in cattle, and are becoming rather common, especially amongst Swiss goats. To those who are not familiar with either term it should be explained that the word is used to mean a goat possessing the genital organs in a more or less imperfect state of both the male and female. The investigation of this abnormal condition has been undertaken by Mr. C. J. Davies, a naturalist who is much interested in the subject, and contributed an article on it, with illustrations, in the *Veterinary Journal* of February, 1913. He reports having examined, amongst others, a kid which looked like a female, but which, upon dissection, proved to be a male, and its general system was normally masculine in every respect. Young goats of this description are quite useless to breed from, and can only serve one purpose, that of draught. When trained early they go well in harness, and do not possess the usual objectionable odour of the male. They grow to a considerable size and are very strong.

Unless intended for such a purpose, kids that are malformed as described should be destroyed as soon as their condition is noticed, but this is often only apparent to expert breeders. When an animal looks like a she-kid, but with none of the feminine characteristics, showing, on the contrary, a bold fearless manner and behaving sexually like a male, its abnormal condition may be suspected.

MILKING A GOAT

A goat should be milked twice a day at least after the kids are weaned, but if she gives anything over 2 qt. daily, three times is better. Regularity in the hours of milking is of great importance, for if a goat is milked at all hours it is undoubtedly detrimental to the supply. Most people adopt the plan I have always recommended of feeding a goat when milking her. It keeps her attention fixed on her food instead of on the process that she is being subjected to, and she stands quieter in consequence. In the same way it will be found most necessary to milk the goat when standing on a raised bench in preference to the ground. This bench may be 15 or 18 in. in height or even more if desired; the goat will be only too ready to jump on to it if she knows her food is awaiting her. Milking is not a difficult performance, but there is a certain knack in it which is only acquired by practice, and the quicker the process is carried out the better for all concerned; for not only does more milk seem to be produced by an expert hand, but the goat gets restless and impatient if clumsily handled and unnecessary time is taken up, with the result that the pail is kicked over before the milking is concluded.

The facility of milking greatly depends on the size, shape, and position of the teats, and the character of the udder. With some animals the milk flows with the slightest pressure of the hand, but with others it is very hard to obtain and slow in coming. When the teats are too small to be grasped comfortably the milk has to be drawn by "stripping" with the forefinger and thumb, which is not strictly milking. In buying a goat, therefore, one of the first things to look for is not only a good udder, but one having nice, long-pointed teats, of such a size and shape that the hand can comfortably grasp them.

After the milk is apparently all drawn, there is always a certain quantity left which should be stripped out. This is encouraged by previously manipulating the udder between the palms, by a kind of

massage process, and even bumping up the udder whilst holding the teats, in imitation of the action of a kid when the milk is slow in coming. This produces a fresh flow which is milked out as before, and then the teats are once again stripped. Some goats are very restless and troublesome to milk. About the worst form this can take is when the goat persists in crouching down so that it is impossible to get at her udder. In such circumstances measures have to be adopted to prevent these tricks. The lying down can be hindered to a great extent by placing a piece of strong webbing under the body, and fastening up each end in some way, so that although her whole weight may be thrown upon the band it still leaves sufficient room underneath to get at the udder. It is better, however, to get rid of such an animal altogether, unless its milking capabilities are something quite out of the common, for there are few things that try the patience more, and milking is then anything but a pleasure. It is a good plan with a new goat or one of questionable temper to empty the bowl when half full of milk into a jug, but always keeping hold of one of the teats with the other hand, for it usually happens when a fresh grasp is taken of these after a certain quantity has been drawn, that the goat suddenly kicks and plants one foot in the receptacle, generally overturning it

MAIDEN GOATS IN MILK

Before leaving this part of my subject I should make some reference to goats that yield milk without having had kids. This often happens, and I continually receive letters from correspondents who think their case is probably unique. How this arises I am unable to say; it is generally supposed to be due to a young goat sucking herself, but I have seen many cases where no such habit has been noticed. In some instances the mammary glands appear to develop at an abnormally early age, and kids at four or five months may be seen with quite prominent udders. It often happens that there is at last such an accumulation of milk in the udder that it becomes almost a necessity to draw it away, and the owner generally wants to know if it is advisable to do so. My answer is in the affirmative, for I do not see that it can harm a goat that is of an age to breed if milked then, any more than if she had had kids in the natural way. Cases are indeed on record where a goat has been in profit for years in this manner and never even been mated.

GOAT'S MILK AND ITS USES

After the milk has been drawn it requires to be strained of hairs and any dirt that may have fallen from the body, though there should be very little of this if the animal has had the udder and adjoining parts first brushed over and then wiped with a damp cloth. The plan I recommend for straining is to place a strip of cheese-cloth, or, as sometimes called, butter-cloth, over a hair sieve and to pour the fresh-drawn milk through both. It is true there is not much left for the hair sieve to do in the way of straining after the milk has passed through the finer material, but it acts as a holder for the cloth, which would be difficult to handle otherwise.

Goat's milk requires to be used fresh, as it does not keep so well as cow's milk, and not infrequently curdles more quickly on being boiled, especially if the cooking process is a slow one.

Most people who have had little experience with goats get the idea that all goat's milk has a peculiar taste—what is generally called a "goaty" taste. Persons who have travelled abroad in Italy and Switzerland may have some ground for this opinion, which is presumably due to want of cleanliness with regard to the utensils used, for in that case there is reason for such an objection. Otherwise, and always assuming that the goats have not been fed on any strong-smelling green food, this milk should have no peculiar flavour, and no one need be deterred from keeping a goat and using its milk on this account. As a matter of fact, those who have once used this milk for domestic purposes never revert to cow's milk if they can help it, for even if the butter-fat constituent be not greater than in cow's milk, as is usually the case, there is always a more cream-like character about it, which is especially noticeable when taken in tea or coffee.

The constituents of goat's milk vary according to the breed to some extent, but also according to the individual and the duration of its lactation. In most of the Swiss breeds, whilst the milk is abundant in quantity it is poor in quality compared to that of other breeds. In the Anglo-Nubian there is more butter fat by 2 per cent at least, and even the common goats give a richer milk than cows. This is clearly proved every year at the Dairy Show, where the milk of the goats in the milking competition is analysed and the results published. These analyses show the percentage of butter fat to vary even in the morning and evening

samples from the same goat. In order to show this, and at the same time give a fair idea of the average amount of butter fat in goat's milk, I will quote here the figures showing the percentage of this constituent in eight samples under examination at the last Dairy Show (1912), being those from goats that either won a prize or a commendation.

Name of Goat.	Breed.	Award.	Butter Fat.		Yield.
			%	%	
Cowslip III	Toggenburg ...	1st prize	5.12 a.m.	4.67 p.m.	7.55 lb.
Cophorne Muscatel ...	A. N. Swiss ...	2nd prize	5.08 "	4.79 "	7.10 "
Wigmore Topsy ...	A. N. cross-bred	3rd prize	4.85 "	6.03 "	5.70 "
Cophorne Red Currant ...	A. N. Swiss ...	4th prize	5.16 "	5.08 "	6.70 "
Cophorne Maisie ...	Swiss	Reserve	3.72 "	3.68 "	6.40 "
Dolly Grey	Anglo-Nubian...	V. H. C.	6.43 "	7.02 "	3.15 "
Cophorne Snowdrop...	A. N. Swiss ...	H. C.	3.74 "	4.88 "	4.45 "
Wigmore Fancy ...	Anglo-Nubian...	H. C.	5.95 "	7.20 "	3.50 "

The above table also gives in the last column an illustration of the yield of goats of exceptional milking capacity, though it must be borne in mind that the quantity of milk is never so great at a show, where the animal is subject to continual excitement and very often annoyance, as it is at home. Thus a goat which gives 3 qt. at a show will give probably 1 gall. in her own stable. Three quarts is the quantity represented by 7.55 lb. in the yield of Cowslip III, as shown above.

It will be noticed that there is a marked difference in the quantity of butter fat in the Swiss goat Maisie and her neighbour the Anglo-Nubian, but a peculiar circumstance contributed to the richness of the milk of the latter, inasmuch as she had been in profit for nearly a year and a half. The milk of the Toggenburg in the above table is much richer than is usually the case with one of this breed.

YIELDS OF MILK

"What quantity of milk does a goat yield?" is a very common question. On this point I may take occasion to mention that it is not wise to accept as gospel all the statements that are made by goat-keepers, especially when a goat is offered for sale. In this connection I may tell of a certain goat in America that was reputed to be giving 6 qt. a day, a yield which I may remark I regard as impossible for any goat to give. In correspondence with an American on this point I ventured to express my views

as politely as circumstances would allow, saying that we in England could not take for granted all we are told in such matters. I suggested as a means of accepting the above statement of 6 qt. that it might be explained on the ground that the quart in America is a smaller measure than in England. To this my correspondent replied with characteristic bluntness: "Our quarts, it is true, are not as large as your quarts, but we have the same-sized liars!" From long experience with goats and goat-keepers, I feel it incumbent on me, therefore, to warn those who propose to invest in a goat to see the animal milked at least once, but preferably twice, before buying it, in order to avoid disappointment and disputes afterwards.

It may be useful here to mention some cases that have come under my notice of exceptional yields of milk, but it must be clearly understood that such animals as give these extraordinary quantities are very uncommon, and fetch high prices when sold. The ordinary supply from a common goat in full profit is from 2 to 3 pt. a day, occasionally 4 pt., and when a goat gives this last quantity it may be regarded as quite a good milker. A few have given over 1 gall. a day, and this even at shows, where no goat is ever at its best, owing to the effect of travelling, the excitement, and suchlike causes, but even here some remarkable returns are recorded, and these cannot be questioned, as the figures are taken before many witnesses. It will be observed that in these, as in all show records, weight and not measurement is given, as the latter is deceptive on account of the froth, which can make a pint and a half look like a quart when first drawn. An approximate idea can be gained of these weights by reference to the following equivalents: 1 gall. of milk is equal, roughly, to 10 lb., therefore 2 qt. will weigh 5 lb.; 1 qt., 2½ lb.; and 1 pt., 1¼ lb. or 20 oz. This is actually the weight of water, whilst the specific gravity of milk is a fraction more, but 10 lb. is near enough for the purpose. Sedgemere Faith, the goat alluded to in the chapter on breeds, gave at its home in one week *five months after kidding*—and this was an important feature of the performance—an average of 10 lb. 5 oz. a day, her yield on one of the days being 10 lb. 10½ oz., or exactly 1 gall. and ½ pt.

At the present day we have extraordinary milkers in Leazes Eve, belonging to Mrs. J. C. Straker, of Hexham; Wigmore Topsy and Cowslip III, lately owned by Miss Mortimer,¹ of Holmwood,

¹ This lady has now given up goat breeding.

Surrey; and Copthorne Orange, the property of Mrs. Handley Spicer, of Chobham, Surrey—these three ladies heading the list of breeders and exhibitors of milch goats in England, whilst Lady Dunleath, of Ballywalter Park, Co. Down, takes the lead with such stock in Ireland.

Leazes Eve, whose milking record I have before me, kidded on 11th February, 1912, and the following week her average per day was 8 lb. 4 oz., the next two weeks it increased to 9 lb. 3 oz., and for seven weeks after that it ranged from 10 lb. 8 oz. to 10 lb. 14 oz. a day, which, as will be seen, is over 1 gall. In the eleventh week this remarkable yield was increased to 11 lb. 4 oz., and in the twelfth it reached its maximum of 12 lb. 3 oz., this being very nearly 5 qt. Fifteen weeks after the birth of her kids this goat had given nearly $\frac{1}{2}$ ton of milk.

Wigmore Topsy kidded 21st May, 1912, and on the 21st September following she gave 9 lb. 8 oz., on the 26th 9 lb. 12 oz., and was still over 9 lb. on 5th October, after a lactation of four and a half months.

GOAT'S MILK AND TUBERCULOSIS

One great feature in favour of goat's milk is its freedom in a general way from that terrible scourge tuberculosis, which so afflicts the bovine species. It is true that goats are not absolutely immune from its attacks, but cases are so excessively rare that it practically amounts to the same thing. For this alone the milk of the goat should be in much greater request, and doubtless it would be were this fact generally known. But strange to say, in England scientists seem to have paid but little attention to the goat and its value as a source of milk. It has been left to French writers to make the investigations which have led to the conclusion announced above. There is only one authority I am able to quote amongst the medical profession in England who has made public reference to this, though there are dozens who have given their testimony in a private way to the value of goat's milk for infants and persons of delicate digestion, or for those suffering from any wasting disease such as consumption. The authority referred to is the late Sir William Broadbent, and his words cannot be too often repeated. They were uttered in the course of an address on "The Prevention of Consumption and other forms of Tuberculosis", delivered at the Technical College, Huddersfield, in October, 1905.

The doctor there said: "It is interesting to note that asses and goats do not suffer from tuberculosis, and to bear in mind that the shrewd physicians of past days used to order asses' and goats' milk for persons threatened with consumption".

PROFIT AND LOSS OF GOAT-KEEPING

Although goats are kept by many people as a hobby, there are scores of persons who have an idea of embarking in this pursuit as a means of improving a slender income, and I am constantly receiving letters asking my opinion in the matter. This treatise would therefore hardly be complete without a reference to this question.

There have been writers, and probably still are at the present time, who try to make people believe that there is something little short of a fortune in goat farming, and one often sees advertisements of goats offered for sale with this object. Some years ago an article appeared in *Country Life* to this effect, and I was assailed from all parts of the kingdom, and even abroad, by applications for information on the subject by people who hoped to retrieve their fortunes in this manner. Let me therefore warn all who have no money to throw away not to be deceived by specious arguments tending to show that a goat farm is a sure road to wealth; and further, to make careful enquiry before placing themselves in the hands of such individuals. There is no doubt that, considering the value of goat's milk, there should be scope for some such enterprise, and no one would be better pleased than the writer to see a trade arise in this commodity. But before such a pursuit can become profitable there must be a demand for the milk, and such demand has not yet arisen. There may be a case now and again where a little business is done with some establishment for the supply of a small quantity of goat's milk, or it may be sold at a good profit to a sick child on the recommendation of a doctor. I have known personally several such cases, but to start a herd of goats on the expectation of doing a regular business in this way would be to court disaster.

It must not, however, be supposed from what I have said above that I take a pessimistic view of goat-keeping for profit, but there are two forms of it—that just alluded to and the domestic side. As an illustration I may take the case of poultry. Everyone knows that the keeping of a certain number of fowls, sufficient

to eat up the scraps from the household as a supplement to what is procured from the corn merchant, or those having the run of a farm, where they consume what would otherwise be wasted, are a source of profit, properly managed; but a poultry farm with all the attendant extra expenses of rent, labour, &c., is quite another matter, and though some are made to pay a good many do not. Here, however, there is something on the other side to balance the cost, as eggs and poultry are in continuous demand winter and summer. With goat-keeping it is not so. People who have no practical experience of the subject talk nonsense about the value of their skins, and point to the enormous trade that is carried on with foreign countries in this commodity. I even read now and again of the value of the milk sold to the large dairy companies, and the price paid for it—from 8*d.* to 1*s.* per quart—all or nearly all of which is pure fiction. I have only heard of one dairy that takes a small quantity of goat's milk with the cow's milk that is sent to London daily, but the income from this is not worth consideration as a living. As a matter of fact, although the demand for goats is enormous in this country, that for goat's milk alone is practically nil, strange to say, and until there is such a demand goat farming can never pay as a matter of business.

Having now disposed of this question it behoves me to show that there is a profit attached to keeping goats for household purposes, besides the pleasure and other advantages to be derived from it. Let us now, therefore, turn to actual figures in proof of this.

I have given in an earlier chapter the cost of keep, and will now compare this with the value of the produce. An ordinary goat will yield milk on an average for the first three months she is in profit at the rate of 3 pt. daily, and during the next three about half this quantity, whilst in the last quarter she will only supply $\frac{3}{4}$ pt. daily. This brings the total to 240 qt. The value of this at 4*d.* per qt. is £4. If a Toggenburg, Swiss, or the right kind of Anglo-Nubian be kept, however, the yield should be for the first quarter at the rate of 2 qt. daily, for the second 3 pt., and for the third (though it may extend to quite another month), 1 $\frac{1}{2}$ pt., giving a total of say 384 qt., which at the same valuation would be worth £6, 8*s.* I am putting this at the lowest price of cows' milk; but goats' milk is really worth 6*d.* a qt., where cows' milk is worth 4*d.*

Let us suppose a person keeps three goats—and in fact that number is really required to maintain enough milk for a household all the year round—and that two are just common goats and the

third a superior animal, such as I have mentioned, we get, at this rate, a return of milk from the three of the value of £14, 8s., whilst the cost of their keep should not exceed £9, or with sundries at most £10.

There may, of course, be other incidental expenses, such as stud fees, litter for the stalls, and the cost of keep of the kids out of the value of the milk. If these are "nanny" kids and the sire is a good one, this cost should be met by the price they fetch if sold, or their value to the owner if reared. Should they be billies, and not have been destroyed as soon as born, they can, if preferred, be killed for the table when a month or six weeks old; but I must warn the reader that they will come considerably more expensive than ordinary butcher meat. In addition, however, to the actual monetary value of the return in milk, something has to be said for the advantage from a health-giving and economic point of view. Where there is a family of young children the blessing of a good home supply of milk is inestimable. In summer, when this supply is most abundant, it goes a long way to reduce the butcher's bill, for with milk and eggs the most nourishing and appetizing dishes can be made, and in almost endless variety.

There is yet another feature of profitable goat-keeping, but this involves the outlay of a certain amount of capital. It is a combination of breeding and dealing in high-class stock. The demand for goats, and that means good milking goats, is, as I have already said, enormous, and where a person is something of an expert and knows a good goat when he sees one, there is certainly a trade to be done in this direction. It should be carried on, however, as stated above, in connection with *bona-fide* breeding, and to do this successfully the best stock must be procured, and with little regard to cost. Where, however, capital to any extent is not available, the cheapest way to go to work is to buy up kids from noted strains, and especially from prize-winners belonging to exhibitors of repute. This can easily be accomplished with young males, as most breeders have more of these than they care to keep, and sometimes more than they can dispose of. Female kids are harder to obtain, but still these are much cheaper to buy than full-grown goats, and in time they form the nucleus of a herd. Goats are constantly being sold in these days at prices ranging from £10 to £20, and instances are on record of much higher figures than this having been paid for celebrated winners. Sir Humphrey de Trafford purchased a noted exhibitor's

entire herd many years ago at something like £10 apiece all round, and this was about the average realized by the herd of the late Baroness Burdett-Coutts when brought to the hammer after her death in 1903. There are herds at the present day which, if sold by auction, would, I venture to think, bring much higher prices per head than this. But in all these cases the owners have made their names not only as breeders but as successful exhibitors.

GOAT SHOWS AND EXHIBITING

Exhibiting is to goat-keeping—where breeding for sale is concerned—what advertising is to a business, and if the goat-keeper is ambitious to make a name, in order to secure big prices for his stock, this is the only way to do it. When a person's name figures frequently at exhibitions as a winner of prizes, especially in milking competitions, a demand for his stock is sure to be created, and then goat-keeping should become a lucrative pursuit, though it must be borne in mind that this brings its attendant expenses.

Goat shows are held annually at the present day at Belfast, Dublin, and Clonmel in Ireland; and in England at the shows of the Essex Agricultural Society and Sussex and Southern Counties (in whatever towns their meetings take place), also at Tunbridge Wells, Hexham, Darlington, and the Dairy Show. There are also minor shows of the same kind held at Lancaster, Tiverton, Southminster, and other places.

This practice of introducing goat classes as an additional attraction to agricultural shows is every year gaining ground, for, being something novel, the exhibits in those classes generally attract a large number of visitors. There are certain requirements necessary, however, in organizing a goat show which differ somewhat from those at other shows, as well as important matters concerning the duties of stewards and the needs of exhibitors, for whose assistance and guidance, therefore, I venture to offer some advice.

HINTS TO SHOW SECRETARIES AND STEWARDS

If the show is of any importance and likely to bring entries from the big breeders and exhibitors, it will be necessary that it be recognized by the British Goat Society, otherwise the awards

do not figure in the Society's prize record, and such awards carry with them qualifications for entry in the Herd Book under certain conditions. There are formal rules issued governing the official recognition of shows, and one of these is that the judge must be one approved by the Society—in other words, figure on the list of recognized judges. Where the show is a purely local affair—and these shows do a deal of good in the encouragement of goat-keeping—the question of official recognition need not be entertained.

One most important matter at all shows is to send to each exhibitor, in addition to the cardboard or linen address label, a metal "tally" or disk, such as is used at dog shows, with the number of the exhibit corresponding to the number in the catalogue. Such tallies may be obtained from Spratt's Patent, Ltd., at 2s. 6d. per 100, numbered from one upwards, or such other numbers as may be required. Their use is as a means of identification should the linen label be eaten off either by the goat itself or by its neighbour. When this happens and there are several such goats whose ownership cannot be discovered, and who have to be returned after the show, much trouble is given to the secretary or steward. Another point bearing on the same mischievous propensity of this class of animal is, to see that all numbers and prize cards are fixed at a sufficient height to prevent the goat reaching it when standing on its hind legs. Or, to put it another way, the animals should be all fastened to rings in the partitions as near the ground as will allow them to stand up in comfort, but not so high as to enable them to get on their hind legs—otherwise prize cards and number cards will be eaten off as soon as put up.

At agricultural shows there is generally one long boarded partition about 5 or 6 ft. high, and the exhibits are arranged on each side of it. At less pretentious gatherings hurdles are mostly used, but these require to be well staked or they will be butted down, especially if there are "billies" in the show.

A troublesome feature of goat shows is that the animals have to be sent in crates on most lines of railway. This adds to the cost of carriage, as a goat in a crate has to be sent from the railway station to the show ground and back in a van. Some railways, however, such as the Great-Eastern, do not insist on this, and then the exhibits can be led to and from the show ground. When goats are removed from a crate those in charge must be careful to see that the crate has an address label on it, so that it may be identified when the goat is to be returned to the owner.

In drawing up an entry form the secretary should see that spaces are provided thereon for: (1) The class. (2) The description—such as male goat, female goat, goatling, or kid. (3) The exhibitor's name and address. (4) The name of the goat. (5) The Kid Register or Herd Book No. as the case may be. (6) Breed. (7) Colour. (8) Date of birth. (9) (If a she-goat) date of last kidding. (10) Name of breeder. (11) Names of sire and dam (if known). (12) Whether competing in the milking competition—supposing there is one. (13) Price (if for sale). And (14) whether the exhibit is the property of the owner at the time the entry is made.

HINTS TO EXHIBITORS

At all shows held under British Goat Society's rules, kids and goatlings have to be entered previous to the closing of entries in the Kid Register of the Society. This is a register of birth, and the requirement is made in order to make sure that the animal exhibited is within the proper limit of age. A kid after twelve months old ceases to come under that term, and becomes a "goatling"; after it has attained two years it becomes a goat. If, therefore, a kid or goatling is not so entered it is liable to be disqualified. The exhibitor must not omit to attach with wire to the collar of the goat when sent from home both the linen label and the metal tally accompanying it. This in addition to an address label on the crate.

Goats should be sent away in plenty of time to arrive at the prescribed hour, otherwise they may be delivered too late for competition. Exhibitors are not infrequently disappointed in this way. It should be remembered that mere size and form do not alone win a good opinion from the judge. A well-groomed animal, sleek of coat, and showing the bloom of health, attracts a judge's eye and will often win a prize where one roughly turned out will be passed over. This grooming should be done some weeks before the show to obtain what is called "show condition". There is also a great deal in the way a goat is held by the owner or attendant. Any observer can distinguish at a glance the difference between the experienced exhibitor and the novice by the way he presents the goat, so to speak, to the notice of the judge. These are little details difficult to describe, and can only be learnt by watching those who are accustomed to exhibit and to win prizes.

There is an advantage to a breeder who exhibits apart from the

excitement of competing and the satisfaction of winning. He has the opportunity of comparing his stock with that of other breeders, without which he cannot form a proper idea of their merits, and often thinks them perfect till he sees how far short they are of perfection by contrast with better animals.

MILKING COMPETITIONS

All the more important goat shows at the present day have their milking competitions, and these are specially advantageous from the point of view of utility, and the fact of the awards not being based on a judge's fancy but on actual facts. They, moreover, give a chance to goats that have no opportunity of winning in inspection classes owing to their perhaps rough appearance or want of merit from the point of view of breed. The one essential here is quantity of milk with due regard to the time they have been in milk. At the Dairy Show this goes a step further for there quality also comes in, and a goat whose milk shows by analysis less than 4 per cent of butter fat is penalized by losing one point at each test.

These competitions, however, involve a certain amount of calculation. The procedure is as follows: The goats having been all milked dry on the evening previous to the competition, the first milking is done directly after the judging by inspection is concluded. Each goat is milked separately in the presence of the steward, and the milk is weighed on a balance furnished with a dial which shows the weight up to 10 lb., with divisions of 1 oz. The weights are first recorded in pounds and ounces, the latter being afterwards shown in decimals, so that they may be added to the figures (shown also in decimals) representing points for duration of lactation. It will be obvious that it would be quite unfair to give points for quantity of milk without taking into account the time the goat has been in milk since the birth of its last kids. Therefore after allowing 1 point for every pound of milk, with fractions of points for fractions of pounds, it is necessary to calculate the number of days since the goat kidded, and to give 1 point for every sixty days, with a maximum of five points. The following illustration will make this clear: Wigmore Tansy at the Braintree Show, 1913, gave in three milkings 14 lb. 4½ oz., or in decimals 14.28 lb., and the points were consequently shown by the same figures (14.28). This goat kidded on 21st March, therefore on 11th June, the opening day of the competition, she had been in milk eighty-two

days, so she gained in points for time 1.36. These last figures added to 14.28 give the total points gained by this exhibit.

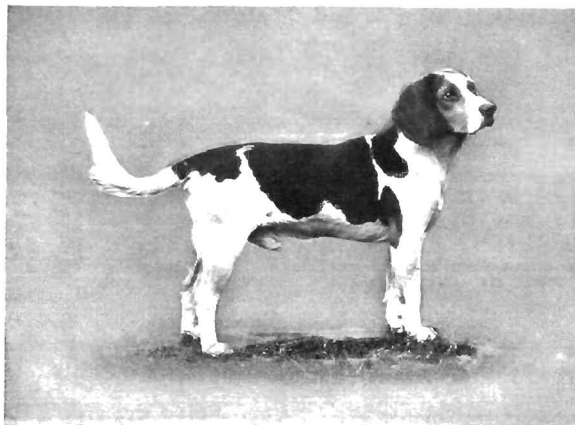
It is usual for the goats in this competition to be milked three times: first at the time stated above, secondly the evening of the first day about 6 or 7 o'clock, and lastly the following morning about 9 o'clock, each yield being recorded in pounds and ounces, and when these are added up the total is transformed into decimals, as shown above, so that they may be added to those given for time.

DUAL-PURPOSE PRIZES

Many people have an idea that exhibition goats, like exhibition fowls in most shows, win prizes solely for their appearance and perhaps for their colour and markings. It is quite a common thing for an application to be made to the writer for a goat, "but not a prize goat, as it is required solely for milk production", as if this feature was quite ignored by goat judges. All inspection awards are based on milking qualities as well as size, form, symmetry, &c. The goat, however, which combines these latter qualities nearest to perfection, whilst gaining highest points in the milking trials, is considered to be the *crème de la crème*, and wins what is known as the Dual-purpose Prize.

The judging in this competition is carried out thus: The best three goats in each inspection class that are entered also in the milking class are brought out and judged together after the ordinary class prizes have been awarded, and they receive points in accordance with their respective positions. This means that the exhibit placed last receives 1 point; that placed last but one, 2 points; and so on to the goat which takes premier position, to which is allotted as many points as there are animals competing. The points thus gained are added to the actual points acquired in the milking class, and in order to give greater prominence to utility the first prize-winner in that class receives an additional 3 points, the second prize-winner, 2 points; and the third, 1 point.

Amongst the most notable winners of this much-coveted prize in recent years may be mentioned: Broxbourne Topsy, Sedgemere Capella, and Sedgemere Cravate, Copthorne Orange, Wigmore Topsy, and Leazes Eve. The late Baroness Burdett-Coutts gave the British Goat Society a silver challenge cup, which is named after her, and is offered annually at the Dairy Show, where it is regarded as the highest and most coveted prize.



BEAGLE, "FORESTER"

Photo, Sport and General



HARRIER, "BOASTER"

Photo, Sport and General



BULLDOG, "RODNEY STONE"

Photo. Art Portrait Co.



BULLDOG, "CHESTOW SYKES"

Photo. Sport and General

CHAPTER III

DOGS AND THEIR MANAGEMENT

BY EDWARD C. ASH, M.R.A.C.

INTRODUCTION

The dog is a member of a large and important order known as the Carnivora, a family distinguished by their habit of living on the flesh of other animals which they have destroyed. This character is of paramount importance, since carnivorous animals are particularly independent of climatic conditions. Nor does the quality of the vegetation play a direct part in their existence, for as long as there are other animals to be found, possibly creatures less powerful or less cunning, they will manage to eke out a livelihood. Thus we see that the Carnivora are found all over the world, and are represented under various and totally different conditions. The heat of the tropics, and the frigid stretches of the far north and south, all have their respective species of this order.

The dog, although a member of the Carnivora, will yet, as we know, live and thrive well on a mixed diet, and will indeed be little the worse if kept a strict vegetarian. In fact, our present-day dogs are omnivorous, and will do well on foods which would be unsuitable for most other animals. We find that their digestive powers are excellent, and bones, fur, or feathers make but little difference. The dog, in fact, like the numerous members of this interesting family, is able to acquire rapidly other habits and readily to adapt itself to changed conditions. The value of adaptability is so easily recognized that we need not waste time in the enumeration of its advantages, and we can little wonder, bearing in mind that this character is most predominant in the Carnivora, that this family has taken and held the lead amongst terrestrial animals.

As a rule the members of the dog family prefer to hunt together, assisting one another with barks and excited yapps, track-



BULLDOG, "RODNEY STONE"

Photo: Art Portman Co.



BULLDOG, "CHEISTOW SYKES"

Photo: Sport and General

CHAPTER III

DOGS AND THEIR MANAGEMENT

BY EDWARD C. ASH, M.R.A.C.

INTRODUCTION

The dog is a member of a large and important order known as the Carnivora, a family distinguished by their habit of living on the flesh of other animals which they have destroyed. This character is of paramount importance, since carnivorous animals are particularly independent of climatic conditions. Nor does the quality of the vegetation play a direct part in their existence, for as long as there are other animals to be found, possibly creatures less powerful or less cunning, they will manage to eke out a livelihood. Thus we see that the Carnivora are found all over the world, and are represented under various and totally different conditions. The heat of the tropics, and the frigid stretches of the far north and south, all have their respective species of this order.

The dog, although a member of the Carnivora, will yet, as we know, live and thrive well on a mixed diet, and will indeed be little the worse if kept a strict vegetarian. In fact, our present-day dogs are omnivorous, and will do well on foods which would be unsuitable for most other animals. We find that their digestive powers are excellent, and bones, fur, or feathers make but little difference. The dog, in fact, like the numerous members of this interesting family, is able to acquire rapidly other habits and readily to adapt itself to changed conditions. The value of adaptability is so easily recognized that we need not waste time in the enumeration of its advantages, and we can little wonder, bearing in mind that this character is most predominant in the Carnivora, that this family has taken and held the lead amongst terrestrial animals.

As a rule the members of the dog family prefer to hunt together, assisting one another with barks and excited yapps, track-

ing down the prey with stubborn determination, and following by scent until the quarry is driven into the open, and is viewed. And then, unless the fugitive has a deep earth into which to escape, it is hunted from cover to cover. The pack will follow by scent and by sight, and should the earth be shallow, the canine pursuers soon tear away any obstructions with their teeth, gnawing through interfering roots, and dig their way after their victim until it is driven once more to seek safety in flight. But dogs have capacious lung power, and are able to run not only fast but far, and the fugitive, wearied by long chase, and bewildered by the cries of its pursuers, must needs run for its life. The end we all know; the pack overtakes its victim, a short, sharp scuffle ensues, and nothing remains but mangled flesh.

Wolves seldom hunt singly, but prefer to form a pack under a common leader, who is generally a large or particularly strong wolf. Their hunting, like that of most other members of the canine race, is characterized by the same determination and patience. Although wolves are timid creatures individually, when in numbers, especially in a large pack, they become savage. In a similar manner the dingoes are harmless unless several of them combine.

The instinct of hunting and of relying on the assistance of its fellows is instructive, for we know that even a little puppy will run to the help of another when it hears the yapping of the chase. We also know that many a dog will show unwillingness to face an enemy or to advance into the darkness unless accompanied by its master, or some other human being, or one or more of its own kind. In fact, we can easily see many characters common to both wild logs and the domesticated species.

Although a dog has claws, it seldom, if ever, uses them for any other purpose than digging—a marked difference from the cat family, for the latter relies on these appendages for capturing its prey, and for defensive and offensive purposes.

The brain of the Carnivora is remarkably developed. Indeed, if contrasted with that of the ox, or even with that of the horse, it will be found to be proportionately larger, that is to say, when their brains are compared respectively with the size of their bodies. Hunting requires much intelligence and thinking power, whilst on the contrary, the habits of the ungulates are particularly inactive, or browsing is in itself a peaceful and brain-resting occupation. The Carnivora are well fitted in every way for the life they are intended to lead, being predominantly intelligent and physically fit,

combining strength with a nicety of muscle control, and being remarkably agile and sure-footed. Quick to take advantage of circumstances, and endowed with pitiless feelings and a love of destruction not easily satisfied, these characteristics, coupled with their easy adaptability to changed conditions, have given supremacy to the members of the Carnivora as a class. Even in the mouth of a dog we see the same provision of Nature—those powerfully-built jaws, so short and strong, able to bite well and to crush with comparative ease, the harder parts, such as the bones, of its victim.

ORIGIN OF THE DOG

Where and how the dog originated has been a matter of much enquiry, but with little definite result. That they are in some manner related to the wolf and other wild dogs, is a certainty. It is, however, difficult to imagine that the powerful St. Bernard is a type originating from the same stock as the diminutive toy dog, spaniel, or terrier. Some agree with Darwin that all varieties of domesticated dogs are descended from two species of wolves, *Canis lupus* and *Canis latrans*, the latter being the coyote or prairie wolf, a creature very similar to a kind of dog found amongst certain tribes of Indians. Other naturalists are of opinion that the fox is the direct ancestor of the modern dog; but this conjecture seems unlikely, for not only do we find that the habits of the two animals are widely different, but also, although wolves and dogs will breed together, no well-authenticated case of a cross between a fox and a dog has been produced. It is interesting to know that not only do wolves breed with dogs, but a cross between jackals and the latter has been obtained.

The Eskimo dog resembles the grey arctic wolf to such an extent that Sir John Richardson, the Arctic explorer, made the mistake of thinking that a number of Eskimo dogs were wolves. It is, however, highly probable that the dog of these northerners is really a domesticated wolf. It is said that the Eskimos actually allow their dogs to breed with wolves, so as to maintain their strength and courage by this infusion of fresh wild blood. We also know that wolf puppies, if captured young, are easily tamed; they make playful and faithful pets, and in behaviour differ but slightly from the domesticated dog.

Wolves and dingoes, and other wild *Canidæ*, never bark unless they are kept with domesticated dogs, in which case the habit is

often acquired, whilst contrariwise we find that dogs during certain periods of their lives, particularly at mating times, howl with the peculiar wail of the wild. Not only does the dog resemble the wolf and wild dog in its appearance, but its habits and peculiarities point decisively to the relationship. Wolves and wild dogs turn round and round to make a hollow in which to rest, an action which at the same time allows the animal to examine its bed thoroughly. The domesticated dog, although sleeping on a carpet or mat, goes through the same performance, because instinct prompts, although the object no longer exists. The raising of the hackles when aggravated, an old habit acquired in order to add an expression of ferocity; the scratching up of the earth with its fore feet and the replacing of the excavated soil with the hind, in order to bury its excreta; the peculiar howling which has already been mentioned; these are all remaining signs of the days when the direct ancestors of the modern dog lived a wild life.

How or why the dog was domesticated by man is not recorded. We can only conjecture that at a very early date of the world's history primitive man realized the wonderful co-operating power of the dog, and obtaining young specimens, tamed them in a manner similar to the modern domestication of young wolves or dingoes. There would be little or no difficulty in breeding others from the tamed specimens, as wolves breed readily in captivity, and we conclude that man broke in the animal to his requirements in order to make it a useful auxiliary. The *Canidæ*, accustomed as they were to submitting to a leader of the pack, would all the more easily obey the master, man. In short, the domesticated or reclaimed wolf would instinctively obey the authority of the man who took the place of the usual canine leader. Endowed, as it was, with natural intelligence of a high order, and also easily able to adapt itself, the reclaimed creature would soon understand what was required of it, and as its duties would be very similar to what its instincts prompted, it would doubtlessly enter with zeal into its fresh life.

Early man would require the aid of the dog to drive into the open animals he wished to obtain either for food or clothing, and we can imagine that in very early times, primitive man and the reclaimed "wolf", or whatever the ancestor of our domesticated dog was, hunted together. Geological finds prove this to be correct, for in the caves of the stone age are found the bones of dogs mingled with the bones of man and other animals. As further

proof we have the carvings on bones. The artistic cave men, when time allowed, depicted on the cleaned bones of deer and other animals pictures of what appear to be dogs.

It is highly probable that primitive man, by the simple method of destroying dogs that hardly suited his purpose, and by breeding from those that in some particular manner were useful, gradually evolved a type. We can imagine that a peculiarly short-legged puppy would impress early man with its possibilities, able as it was to force its way into burrows, or beneath fallen trees and other obstructions, and enter into the very home of some animal that would otherwise be out of the reach of its pursuer. Bearing this in mind, it is not difficult to imagine how a short-legged variety of dogs might gradually be produced. Again, a particularly large specimen would soon prove his value, as because of its size it would be able to pull down its quarry all the more easily. But although primitive man has left many traces of dogs, yet the story of their origin and domestication is largely a matter of conjecture.

THE DOG IN HISTORICAL TIMES

Coming to historical times, we have evidence of the existence of distinct varieties, or types, at a very early period. About 3000 B.C. Egyptian monuments were adorned with representations of dogs of various kinds engaged in their respective work. Some are decidedly savage and wolf-like in appearance, with erect ears, and long, thin, tapering tails; others again are slim in stature, and are seen busily engaged in the pursuit of fast-running animals; whilst yet others are short-legged creatures very similar in appearance to the modern Dachshund.

Dogs in Egypt were favourites, and the short-legged varieties were even in those days trusted household pets. When a dog died, not only was there a family fast, and a religious ceremony, but the remains were embalmed and laid to rest in a special cemetery. In Assyria dogs were used for hunting; two types are depicted on sculptures, one a greyhound and the other a splendidly well-proportioned mastiff-like creature. In the bas-reliefs we see these dogs on their way to the chase, with their tails well pulled up, typically keen and pulling at the lead that holds them. One can actually see that the attendant has some difficulty in restraining the animals.

In Greek and Roman times, dogs played an all-important part.

Some of the Greek dogs resembled mastiffs and were of a most formidable appearance. They were furnished with heavily spiked collars, and sometimes even with coats of mail, as a protection against their enemies. The Romans not only used dogs for hunting and looking after sheep, but also for fighting bulls and other wild animals. We read that the Romans imported British mastiffs to combat wild bulls in the amphitheatre. Sporting dogs, *canes venatici*, were divided into fighting dogs and hunting dogs.

The first mention of dogs in Scripture, is during the sojourn of the Israelites in Egypt. As Leighton remarks, it is possible that the abhorrence of the Hebrews for the dog was partly due to their disgust with the Egyptians for worshipping these animals, but it must also be remembered that dogs acted as scavengers in the East, clearing up garbage and demolishing refuse of all kinds, and the dog was everywhere known as an unclean beast.

THE DOG IN AGRICULTURE

The uses of the dog in agriculture are varied. Farming to-day is a business, and in this as in every other, each penny should be looked after, so that the pounds may look after themselves. Hence not only does the farmer sow his corn, but he must protect it against the various animals that will attack the young plant and demolish the grain when harvested. Among mammals, the rabbit and rat are the most detrimental, and the damage done by them is enormous. Fortunately for man, dogs, and terriers in particular, have a natural and bitter hatred for rodents of all kinds, and are never so happy as when on the scent of one of these creatures. That is one use. Again, on pastoral farms the sheep-dog is of inestimable value, not only in herding the flock, but in assisting the shepherd in various other ways. Retrievers, spaniels, and other sporting dogs also play their part. Then again, the watch-dog, whether well-bred or mongrel, is a most useful adjunct to the farmyard. With his quick senses, he is able to catch the faintest sound; any unusual noise wakes him, and he is keenly sensible to his responsibilities.

In a work of this kind, which is intended for farmers, it is not necessary or desirable to deal with all the many different breeds of dogs known to the dog fancier. That is beyond the scope of the present chapter, and the writer will confine himself principally to the breeds of dogs which may be regarded as having, for one reason or another, an **interest** for those who are engaged in farming.

BREEDS OF DOGS

Beagles and Harriers

The Beagle is a dog which can boast of considerable antiquity, and in many respects resembles the Foxhound to which he is undoubtedly related. He is, however, much smaller than the Foxhound, and his head and muzzle are finer. Of late years considerable attention has been devoted to the improvement of Beagles, and there are some who think that the tendency has been to reduce the size too much, with the result that the usefulness of these hounds, especially for hare-hunting, has been considerably impaired.

There is an impression that Beagles as a breed are less hardy than other dogs, and require more careful management. It is hardly correct, perhaps, to assume that this is true of the adult hounds, but it is certainly often the case that Beagle puppies are delicate and difficult to rear. The general points of the Beagle closely resemble those of the Foxhound, always bearing in mind that he is a smaller dog than the latter, which he also resembles in colour.

The Harrier, as the name indicates, is a hound that is used specially for hunting the hare. He is frequently classified with the Beagle, but is bigger than the latter, although smaller than the Foxhound, to which he is related and bears a distinct resemblance. In some cases Harriers have even been known to be used occasionally for fox-hunting. Present-day Harriers have more size than those of the past, and as there are many who think that the modern Beagle is too small, so there are some who consider that the tendency with Harriers is to produce rather too big a hound for the purpose for which he is intended. The Harrier was originally much heavier in the head than the Foxhound, but there is now much less difference between the two breeds in this respect than was the case formerly. It is still possible, however, to distinguish between a Harrier and a Foxhound in many cases by the former's heavier head. Apart from this, and the colour, which is, in the case of the Harrier, not infrequently blue-mottled, and the generally smaller size, the features of the Harrier are very much the same as those of Foxhounds.

Bulldogs

"The British hound, that brings the bull's big forehead to the ground"; so wrote Claudian. But whether these lines described the Mastiff, or the lesser Bulldog, it is impossible to say. It is, however, very likely that the Bulldog is descended from the Mastiff. The first actual mention of the Bulldog as a distinct breed occurs about 1631.

In the Middle Ages and later, this dog was used for bull-baiting, an exceedingly popular sport, in which the unfortunate bull was fastened to a ring by a short rope attached to its horns, and was attacked by Bulldogs, the latter attempting to seize it by the nostrils, which the bull frequently prevented, we are told, by making a hole in the ground in which it buried its nose. This cruel sport was continued for a long time in spite of much opposition, partly because it was considered that the flesh of baited bulls was more tender than if the animal had been killed in the usual manner. The Bulldog's advantages for this sport lay in the fact that firstly, it was not only very tenacious, but particularly savage; its short legs also would allow it to reach the bull's nose with greater ease than a larger animal.

In the beginning of the nineteenth century there seems to have been a great deal of cruelty, and the lower animals were subjected to much senseless torture. We read of bulls covered with fireworks, dogs likewise adorned, cats tied to bulls' tails, and various other forms of brutality. Eventually, after much agitation, bull-baiting was made illegal, and although for a few years the law was occasionally broken, yet heavy punishments soon put a damper on the sport, and it died out.

The present-day show Bulldog is the product of the art of the fancier, and a queer-looking animal in many ways it certainly is. A few years ago all sorts of methods (some exceedingly cruel) were employed to produce the desired effects. The most famous Bulldog of modern times was Rodney Stone, who was sold for £1000, to go to America. Not only was he a champion dog, but, as it frequently occurs in all live stock breeding, that a single animal predominantly stamps the following generations with its characters, so did Rodney Stone. The strain of dogs to which he belonged was originated by Mr. Walter Jefferies; it has produced numerous winners, and many famous dogs, all relations of Rodney Stone.

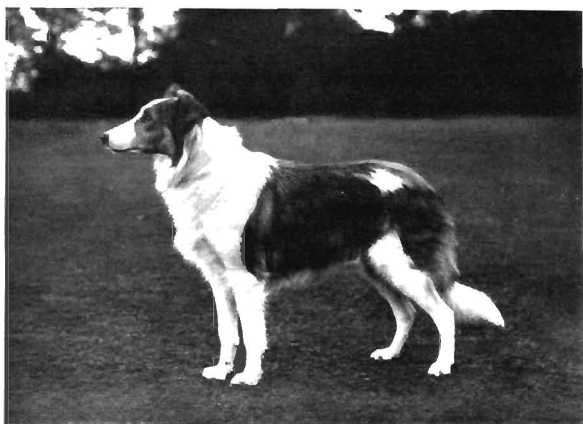


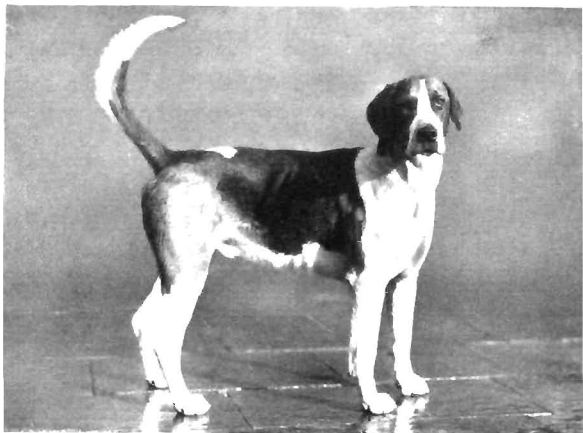
Photo. Sport and General

COLLIE, "WOODMANSTERNE SYLVIA"



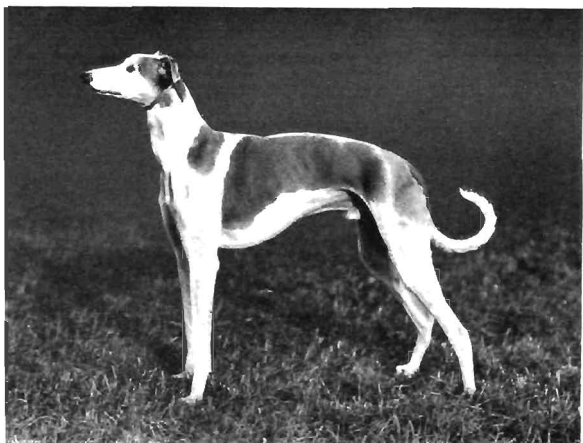
Photo. Sport and General

OLD ENGLISH SHEEPDOG - "BRENTWOOD BOB"



FOXHOUND, "PRIMATE"

Photo, Sport and General



GREYHOUND, "BROADWATER BENDER"

Photo, Sport and General

The typical Bulldog should be an animal determined in expression, and of immense strength, but all the same active. Great strength in front, a short broad back, and very muscular neck and face, and powerful jaws, are strong points. The fore legs should be short with broad and muscular shoulders. In short, the Bulldog should personify immense power. The present-day dog is not so savage an animal as many think, but on the contrary is a useful and frequently a particularly good-natured pet and house companion. The writer, from personal experience, can testify to the good nature of those with which he has come in contact, and very many true stories are related which prove that the Bulldog is by no means the surly, ill-tempered creature we are often led to believe, but is capable of great devotion.

Yet blood will tell, and the majority of Bulldogs are the most terrible fighters if they are once started; they must be kept under very good control, for it must be remembered that a Bulldog, if it loses its temper, is no small handful to manage.

Bulldog puppies and young dogs are exceedingly delicate, which is possibly the result of so much interbreeding. They are often, therefore, somewhat troublesome to rear.

Collies

The Collie is one of the favourite breeds of to-day; from the nobleman's castle to the cottage, he finds a home. This popularity need cause little wonder, for it is one of the most handsome breeds in existence, and a good specimen is certainly a splendid creature to look upon.

Sable and white, golden chestnut, and various other colours have all their respective admirers, but the actual shade is of little or no importance as long as its points are what they should be. Its intelligence is endless, and its fidelity unbounded; in fact, few dogs have so fertile a brain and so original and domesticated a nature as the Collie.

Its history is uncertain, but from what we can ascertain Setter blood has at some time or other been introduced. A few writers have suggested that the Collies are related to foxes, a view quite as probable as the idea that our friend the Bobtailed Sheep Dog is the result of a cross with a bear, owing to its ambling somewhat resembling the latter animal. The only foxlike characters of any

particular note in the Collie are the bushy tail and the long pointed face. It is idle to attempt to describe a good Collie; those who know a dog when they see one, will immediately pick out the best specimens, and a visit of the amateur to a good dog show, equipped with notebook and pencil, will accomplish the rest.

Of the modern Collies, the most famous was a dog called the Squire of Tytton; but unfortunately, like most other good things its value to stock breeding and to the nation was only too quickly recognized by our American cousins, to whom it was sold for £1250. But fortunately for the Collie in our islands, Squire of Tytton left behind him several worthy descendants, which, although not fit to be compared with their great ancestor, yet will be the means of carrying on the strain.

At sheep-dog trials, it is interesting to know that black-and-white, rough-coated Collies usually do better than the Smooth-coated kinds. The latter are the result of an infusion of Greyhound blood, and are exceedingly handsome dogs, particularly if the colouring is dense and not "spotty". The most famous dog of this variety was Eastwood Eminent.

Collies, owing to a mistranslation of dog expression, have had, and have to-day amongst some people, the reputation of being "nasty treacherous animals", to be much feared. But this is not so; the Collie is by no means a treacherous, unreliable animal, and he or she who has this idea, and whose experience is perhaps based on a single instance of canine ill-nature, should realize that they are doing the breed an injustice. No dog, except possibly the Terrier, has had so many admirers, and has held so great a sway and so responsible a position in households as the Collie. The Collie, in so far as he is a sheep-dog, is also pre-eminently a farmer's dog, and should be given an important place in association with farm live stock.

Dalmatians

The Dalmatian very much resembles a spotted Pointer, and may well do so as it is more than likely that its origin lies in a cross between the hound and the Pointer. The old Dalmatian must have been very similar to the present-day dog, if we can rely on a sketch made by Bewick in 1790. It was customary in former times to cut away the entire ear flaps and expose the aural cavities without any protection whatsoever.

Foxhounds

The Dalmatian is particularly fond of horses, and is perfectly contented if allowed to live in the stables amongst its equine friends. When the carriage turns out, the Dalmatian will only too willingly run beneath the vehicle. It was owing to this habit that it earned the name of carriage- or coach-dog. The intelligence and tracking power of the breed is remarkable. On one occasion, some thirty years ago, a Dalmatian, which usually went out with the carriage, was inadvertently left locked up. An hour or so afterwards it managed to obtain its liberty, and without more ado, ran into the road and actually tracked the carriage through the streets of London successfully. Considering the amount of traffic, this was a remarkable feat.

The breed, although to-day very much neglected, has still great possibilities. There seems little doubt that the Pointer blood may stand it in good part, and that before many years the Dalmatian may be trained to the gun.

There are two varieties, the liver-spotted and the black-spotted. In both the spots should be very distinct, the size varying from sixpenny pieces to florins. The black-spotted variety should have a nose of the same colour, whilst the liver Dalmatian has a brown nose. Pups are not born spotted; the spots are only developed when the youngsters are about three weeks old. Although it is to-day no longer a popular variety, yet years ago it was in very great demand. In 1820 it came into fashion, and continued in favour for very many years, but gradually the breed lost interest, until at the present day it has little value except as a watch-dog or show animal. It is said that the coach-dog was introduced from Dalmatia simply on account of its sporting qualities, and so perhaps one of these days the breed will again attract notice in this direction.

Foxhounds

Fox-hunting having long been such an important feature of sporting life in the British Isles, the Foxhound naturally occupies a very prominent position amongst British breeds of dogs. The modern Foxhound has a long lineage, being no doubt descended from the hounds which our ancestors used, and which they so highly valued in connection with the pleasures of the chase. Early illustrations of hunting scenes show a type of dog in many respects similar to the present-day Foxhound. The modern hound, how-

ever, has been greatly improved as compared with the old Southern Hound from which he traces his descent. More care has been devoted perhaps to the improvement of Foxhounds than to that of any other canine breed, and it is to careful breeding and selection over many generations, that the present undeniably high qualities of the Foxhound are due. In scenting powers, the Foxhound is probably superior to all other breeds of dogs. While other sporting dogs have a very keen sense of smell, the extraordinary degree to which this sense has been developed in the Foxhound is an illustration of what may be accomplished in animal breeding by following scientific methods.

Foxhounds all over the country are of a type which is unmistakable, but there are, nevertheless, certain minor differences to be observed between packs in different hunting districts, the hounds having to be more or less adapted to the nature of the country over which they run.

The Foxhound should be powerfully built, but all parts of his body should be free from coarseness. The head should be relatively large, the muzzle broad and long, the nostrils being open and prominent. The shoulders should be muscular, the ribs well sprung, and the loins strong. The chest should be deep and fairly wide to secure plenty of lung space. The fore legs should be perfectly straight with plenty of bone. A coat of too fine a texture is not regarded with favour, and it should therefore be somewhat harsh. In colour, Foxhounds vary, but they are usually black and tan with some white, or black and white with a little tan.

Great Danes

The Tiger Mastiff, Almer dog, German Mastiff, Boarhound, and Great Dane are all one and the same thing, the last name being the correct one, although it would be difficult to say in what way it resembles a Danish dog, or even whether its ancestors were brought from Denmark. The Danish dog is a very poor thing indeed, and does not seem a likely ancestor for so fine an animal. But whatever its history may be, we certainly know that the Great Dane is a very ancient breed, and was used in olden times to hunt the wild boar, perhaps by the Romans.

History relates that about the year 1870 it was introduced into Great Britain, and about that time we find it referred to as the



Photo. Sport and General

GREAT DANE, "VREIST OF REDGRAVE"

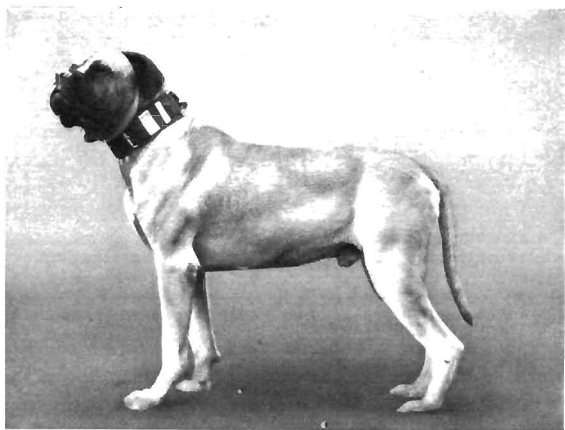
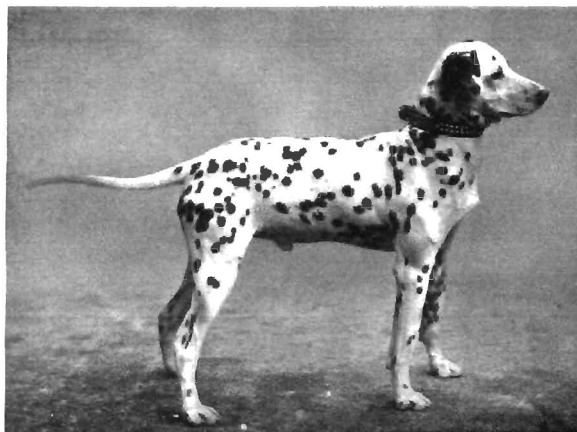


Photo. Sport and General



NEWFOUNDLAND, "CH. GIPSY BARON"

Photo. Sport and General



DALMATIAN, "PARTNER"

Photo. Sport and General

German Mastiff. A particularly savage dog known by the appropriate name of Satan is the first dog to be mentioned by a writer of those days. The modern Great Dane is a large dog, weighing about 130 lb. and standing nearly 3 ft. high. It is for large game hunting in tropical countries that the Great Dane is particularly suited, for it is a large dog with plenty of pluck and endurance, and great strength and agility. It has also the fortune to be able to thrive in hot climates.

As a British dog, however, it is not in very great demand, for although a very intelligent animal, it is somewhat easily excited. This is rather a drawback, as a badly-trained animal or one even temporarily out of control is a highly dangerous luxury. This may have had something to do in lessening the popularity of this breed.

The dog is only fully matured when one and a half to two years old, and during puppyhood requires very careful feeding in order to assist it in making plenty of bone. A fair amount of exercise is essential, but this should be at the dog's free will, as long walks whilst yet of tender years are detrimental. The colour of the Great Dane, until quite recently, seemed to be taken little into consideration, but to-day the brindle, fawn, black, and harlequin are the most popular. The tail, the carriage of which is a matter of importance, should not curl up nor be held too high. Unscrupulous breeders may fake the tail when it is incorrect, but it is a very simple matter to determine if this has been done, for if the dog be excited, it will raise its tail with the result that the end will seem to be hardly in continuation, and will hang limp and lifeless.

That the Great Dane may still have his day in this country is yet to be seen, for gradually the idea is gaining ground of using dogs for the tracking of criminals, and one could hardly imagine a more suitable dog for the purpose than this breed, even if only used for crossing with smaller varieties to obtain greater strength and size. As to the points of the breed, it is a mistake to think that Great Danes should be great, clumsy, heavy-looking animals; on the contrary, they ought to be the acme of grace and power.

Greyhounds

The Greyhound is certainly one of the oldest pure breeds of dogs in existence, and is very possibly the most ancient of all. In Assyrian and Egyptian times the Greyhound was used to course

the hare and other fleet-footed animals. Yet time has made little difference to its shape and general characteristics, for it is even at the present day much the same animal as it was then depicted. In fact, for many ages it has been a well-known dog for coursing purposes. Aranius, a Greek writer who lived A.D. 90 to 170, in his treatise on hunting, tells us about the coursing of that period, and, strangely enough, the methods of procedure were very similar to the modern sport, except that there were very few rules, if any.

This splendid racing dog has long been recognized as the embodiment of grace. The Greyhound is spoken of in Scripture as a dog which "goes well and is comely in going". Grecian art depicts it both couchant and running in the chase, and later, during the Middle Ages, the Greyhound appears in paintings and a tapestry, especially in the Bayeux tapestries. Its grace, its gility, and its perfect symmetry have singled it out as the dog of kings. Although much used for coursing from early times, yet no clubs of any repute existed until 1776, when Lord Orford founded one at Swaffham, in Norfolk. In 1836 the Waterloo Hotel originated a small eight-day stake at Sefton Altcar, near Liverpool, and gradually the meeting became more and more popular, until during the last few years it has become the great ace in the Greyhound world—a race with large prizes and of three days' duration. The Waterloo Cup, which in itself is valued at £100, and a purse of £500 which goes with it, is competed for by sixty-four dogs. The winner must beat six dogs on points. The runner up wins £200, the third and fourth get £50 each. In addition to the above, four dogs win £36 each, eight win £20 each, and sixteen win £10 each. The thirty-two dogs which are beaten in the second round enter for the Waterloo Plate, value £145, the winner taking £75, and the runner up £30. No dog is allowed to enter unless it has a pedigree, and the entrance fee is £25.

Master M'Grath was one of the most famous Waterloo winners. His dog was certainly a wonder. He won the race three times, and was only beaten once. Out of thirty-seven courses he won thirty-six, and amongst these successes he actually, as already stated, won the "Derby" of the coursing world three times.

Another famous dog was Fullerton, who, whilst the property of Colonel North, won the cup four times. Colonel North had paid 850 gs. for him, which was at that time a record price. Unfortunately, after his coursing career was ended he was found to

be of no use for the stud. After this he was returned to his former home and eventually he died, and stands to-day in the Natural History Museum at South Kensington.

The records of the dogs mentioned above are exceptional, as very few win the cup more than once. It is interesting to know that Master M'Grath was not a very large dog, and in fact only weighed 53 lb. On this account he was humorously named the Irish Terrier. But although handicapped by being so small, he was nevertheless out of the slips like lightning, and as agile and quick as greyhound could possibly be. Coomassie, who only weighed 42 lb., was probably the smallest bitch that has ever won the cup. Bab at the Bouster is considered by many to have been the best Greyhound of modern times, and her progeny have become world-famous.

Mastiffs

The Mastiff is the oldest British breed, and it is generally thought that it was introduced into our country by traders, possibly the Phœnicians, as early as the sixth century B.C. But the history of its origin must remain in oblivion, although we know for certain that the ancient Assyrians and Egyptians had a dog very similar to the modern variety. In later history we read that British Mastiffs were pitted against the Pugnaces of Epirus, and we are glad to notice that the British dogs won. We also read that two kinds of Mastiffs existed, one a large and the other a small species, possibly the ancestors respectively of the Mastiff and the Bulldog. Strabo mentions that these dogs had flabby lips and drooping ears, a point which is rather noticeable in the Mastiff.

In early British history, during Anglo-Saxon times, every two villains were required by law to keep one Mastiff, with the object of checking the various wild animals which abounded, wolves in particular. During these times the breed was of some repute as a watch-dog, and went by several names, such as Tiedog or Bandog. It was often used for bear and lion baiting, and it was customary to consider a bear equal to three well-trained Mastiffs, whilst four were necessary to pull down a lion. We read that, in 1572, Lord Brockhurst, one of Queen Elizabeth's French ambassadors, owned a famous large dog that actually baited a bear, a leopard, and even a lion, and managed single-handed to beat them all.

If we are to judge the Mastiff of those times by the various

sketches and paintings handed down to us, we can only regard the present-day representative as a very much improved animal, for we see in those sketches a creature of repulsive appearance, with closely-cropped ears, deep undershot jaws, and with a white blaze down its face. But even the Mastiff of the last century was a very different dog indeed from the well-built powerful dog of the present.

A comparatively few years ago, the colours of the Mastiff were various: reds, blacks, and whites were met with, but to-day reds and blacks are practically extinct, whilst whites are by no means favourites. The present-day dog is either fawn or brindle, with nose, muzzle, and ears black.

The oldest strains, from which practically all champions are descended, are the Chatsworth, and that of Mr. Kingdom, who bred Mastiffs some fifty years ago. Another old strain, kept by the Leghs of Lyme Hall, Cheshire, dated back to the fifteenth century. This variety had longer muzzles than the modern dogs. The purity of Mr. Kingdom's strain is rather a moot point, for although he himself assured breeders that they had been kept pure, no pedigree existed to prove his words, and moreover it is said that he himself informed another that a cross had been resorted to.

One of the most famous stock getters in the Mastiff world was Governor, a dog owned and bred by Mr. Lukey. Indeed, very few dogs with any reputation whatsoever do not carry this name in their pedigrees. Ch. Beaufort, bred by Mr. J. Sidney Turner, by Beau out of the bitch Lady Isabel, was considered to have been the most perfect Mastiff of the last quarter of the century. In fact, both at home and in America he carried everything before him.

Ch. Minting, by Maximilian out of Cambrian Princess, was exported to America in 1888, and is considered to have stood second as the typical specimen to the champion Beaufort. It seems rather a pity that both these fine dogs should have left our country.

The present-day breeders are tending somewhat to produce their dogs with over-short muzzles. That a short muzzle is required is certainly so, but abnormalities are not. The Club requires a muzzle, if compared to the whole face and head, to be 1 to 3. As to the mouth, it is again a question as to whether they should be level or undershot, but the majority will be found to have the latter-shaped mouth; but whatever the shape of the mouth and the length of the muzzle that may be required, the breed

should be kept a large one, and should not be spoilt by such insignificant points. The dog should not be leggy, but ought to stand about 30 in. high, and weigh some 170 lb. During puppyhood care must be taken not to get a youngster too fat and heavy.

Mastiffs are as a breed very good-natured indeed, but, of course, occasionally hot-tempered specimens are met with. As in many other animals, the temper is often the fault of the breeder and trainer more than of the dog himself. It is therefore important, when choosing dogs for mating, that the temper as well as the general appearance should have consideration; and above all, it must be remembered that the pedigree of a dog is often of much more value to the breeder than the appearance of the individual itself.

Newfoundlands

Has any dog received so much praise from poet, and so much regard from general humanity, as this member of the domestic Canidæ? Sir Edwin Landseer's painting, "A Distinguished Member of the Royal Humane Society", is a picture we see when we are children, and never forget, although the memory of other pictures may fade rapidly. Byron, as we know, erected a monument to his dog, a Newfoundland, and wrote some touching lines that will be handed down for generations.

The dog is a large handsome creature, with an appearance that impresses one with a feeling that it knows and thinks deep things, a feeling in a child of a superior being, for its rather sunken and perhaps sad eyes speak of mysteries, as if the dog watched and realized the struggles of humanity.

It is a rather larger dog than the Mastiff, with water-resisting coat, and partly webbed feet, for it is in truth a water dog. Its original home was Newfoundland, where it was used as a sledge dog, and fed on fish refuse. It has the reputation of remarkable endurance, being able to do with practically no food when occasion demands. Originally there were several colours, but to-day there are only two, the black-and-white, and the black. Newfoundland dogs are of two kinds, the large and the small. The dog when moving has a typical roll, somewhat of a nautical kind. The adult dog will weigh up to nearly 10 stones, but the average is considerably less than this.

A few years ago, the breeders produced a dog with a more

sporting expression, but this is going rapidly out of fashion, and the old thoughtful-faced dog is again taking its place.

The Newfoundland, owing to its size, is an expensive dog to keep, and for this reason is not so general as one might expect, but as the feeding of animals is made cheaper by the better understanding of foods and feeding, and by the using of reconstructed refuse matter, the larger breeds will become more popular.

Old English Sheep Dogs

The Old English Sheep-dog, or Bobtail, is an ancient breed, and has possibly originated from dogs introduced years gone by from foreign countries. We find that the sheep-dogs of Russia and other continental countries are very similar to the British Bobtail, except that they are very much larger and vary in detail.

The dog naturally has a liking for minding sheep and other animals, and if properly trained will do the most remarkable feats, requiring much intelligence. We read of these dogs fetching in the cows for milking, placing each animal in its individual stall, sorting out those that have been milked from the remainder, and again of their picking out the strange sheep which have joined the flock, and doing many other duties that one would consider would require the aid of man's intellect or be even beyond his ken.

The Bobtail is a thick-set, well-made animal, profusely coated with dense long hair, giving it a very shaggy appearance. There should be little or no curl, and the hair should be hard. As to the colour, it matters little as long as it is grey or bluish; brown and like shades are strongly objected to. One can hardly see a finer-looking creature than a really good specimen of the blue-and-white Bobtail, standing well on its legs, which are by no means "leggy". Its hind quarters are particularly well covered with hair; and last, but not of least importance, a large sensitive black nose completes the picture. In fact, the typical Bobtail looks, as he is, a most useful member of canine society, not only in strength and build, but also in intelligence.

It is difficult to say what this dog would be able to do, if its capabilities were developed by breeding generation after generation from specimens of particular working merit, and it seems a great pity that shepherds should be willing to keep any kind of mongrel, of Collie or Sheep-dog extraction, and breed promiscuously with

any dog, rather than keep pure animals and develop their natural instincts.

Some Bobtail pups are born with long tails, whilst others come with the naturally short appendage. This is a rather interesting fact, pointing to bobtailed dogs being a natural breed. The story goes, that in days gone by, the shepherds' dogs were free from taxes, and that their dogs might be distinguished from the non-working specimens they had their tails cut off, and Nature, wishing to assist the shepherds, made the breed a bobtailed one. It is to be feared, however, that this does not altogether explain the bob tail.

Amongst well-known Old English Sheep-dog enthusiasts were Dr. Edwardes-Ker and Dr. Locke, who spent endless time and trouble in their efforts to improve the breed.

Pointers

The Pointer was introduced into this country some two hundred years ago, possibly by Baron Beehill, who resided in Norfolk. It was a thicker, clumsier, and far slower dog than the modern Pointer, although quite fast enough, however, for the days of ramrod and barrel loaders, when the sportsman required some time between the shots. But gradually, as shooting became a faster sport, the slow Pointer was out of his element, and no longer required.

Colonel Thornton, in order to give the breed greater strength and agility, crossed some Pointers with Foxhounds. About the same time several other breeders did likewise; crosses from one kennel and another took place, and the modern breed of Pointer is the outcome. It is thought that possibly Greyhound blood was introduced at one time or another in order to obtain a more active animal, but this seems to be a matter of some uncertainty.

It is most fascinating to watch a brace of Pointers at work, running rapidly here and there until suddenly slowing up and standing perfectly still, with head thrown well forward and tail outstretched, in all respects resembling a statue.

The usual colour for Pointers is lemon-and-white or liver-and-white, but other colours are sometimes seen. The coat should be dense and short but soft to the touch. A Pointer dog will weigh about 60 lb., and a bitch perhaps 4 or 5 lb. less.

Those interested in Pointers and Setters should take an opportunity of visiting the Kennel Club Pointer and Setter trials, and if the weather be favourable, and the visitor is at heart a dog lover, we may be sure that the possession of one of these intelligent and fascinating animals, who behave in so wonderful a manner, will be a thing to dream of.

Retrievers

We can fairly claim that the Retriever is the most useful shooting dog that we have, for both partridges and pheasants. Endowed with a splendid nose, he passes very little unnoticed, and his size and strength give him the advantage of being able to cover the maximum of ground in a minimum of time. In fact, in this dog we have a generally useful sporting asset.

The Curly-coated Retriever was possibly produced by several crosses, in which the Poodle played an important part. One might, at a glance, think that this was an insult to the Retriever, but it is far from being so, for the Poodle is a naturally first-class water dog of surprising intelligence. The Labrador Spaniel, as it was then called, and which is to-day known as the Labrador Retriever, was introduced into this country about 1850, and played an all-important part in producing the present-day Retriever.

A quarter of a century ago, the Curly-coated Retriever was the only one known, but later a cross between the Labrador Retriever and the Setter resulted in the Flat-coated dog of the present time, and this variety, from its sheer merit as well as from its beauty, took the lead, and is to-day the most popular of all. The Curly-coated, to give it its due, is a pluckier and hardier dog, and perhaps the more suitable for water work, such as wild fowling. But the wavy-coated Retriever has a much more even temper, is a better companion, and last, but not of least importance, has a softer mouth. This point is of the greatest importance, for a dog that crushes the game or handles it roughly is of very little use and is best left at home. When considering retrieving only, the more gently the birds are carried the more the value of the dog to modern sportsmen.

A Retriever should be chosen with a good broad forehead, with intelligent eyes and expression, for the work the dog must do requires a great deal of thought and judgment, and a brainy dog

is far easier to train than the other kind. The usual colour is jet-black, but breeders will often find a liver-coloured pup amongst their litters, and this does not mean that the bitch or dog is not pure, for even with the purest parents, liver-coloured puppies will make an appearance occasionally.

The Labrador Retriever, which, as we have already seen, is the ancestor of the smooth and curly variety, has altered little if at all. It is possible that the Labrador is related to the Newfoundland; in fact, we find that in the old days many of the Labrador Retrievers were chronicled as Newfoundlands. The Labradors are splendid Retrievers, a hard-working enthusiastic breed of such intelligence that they require, if properly bred, little or no training. Even puppies of tender age will often retrieve the most difficult shot, which necessitates using their brains to a surprising extent. Quick and persevering, as keen as keen can be, full of affection for those they know, with intelligence far above the average, such is the Labrador, the ancestor of all present-day Retrievers.

One cannot too strongly urge breeders of Retrievers, whether of the flat-coated, curly-coated, or Labrador varieties, to breed from the best working dogs. The working capabilities of the sire is of far greater importance than its general appearance, and plenty of intelligence is of paramount importance if the dog is to be of any value in the field.

Setters

The Setter, which is a moderately old English breed, was well known in the middle of the sixteenth century. There are three varieties—the English, the Gordon (or black-and-tan), and the Irish.

In the old days the Setter was much used in the capturing of game in nets, and also to frighten up game birds for the falconers. The Setter, like the Pointer, has extraordinary scenting powers, and when at work in the root fields or on the corn stubbles it is certainly at its best, and little seems to escape it.

The Gordon Setter originated at Gordon Castle in Banffshire, the Highland seat of the Dukes of Richmond and Gordon. It was thought to have been a cross between an English Setter and a Bloodhound. At first these dogs were somewhat heavy and clumsy, but the introduction of Irish blood did much to improve their appearance. Somehow or other this variety of Setter is not

particularly popular. They are heavier than the English or Irish breed, and show more of the hound characters and not so much of the Spaniel.

The Irish Setter is a handsomer dog than the Gordon variety, and is certainly far more popular. It is very similar to the English Setter in its appearance, except for its colour, which is often a beautiful chestnut of a golden shade. The dog is an excellent mover, and is very popular, particularly in its own country. It has, however, the reputation of being somewhat headstrong, and for this reason is not so much used as its English relative; but this is denied by those who really know the breed, and is put down by them to want of knowledge or prejudice.

For walking up game, Setters or Pointers are the dogs required; and as long as this sport continues, and whilst man cares for a really good-looking animal as a companion, the Setter will gain rather than lose its popularity. And for the lone sportsman—lover of nature as well as lover of the gun—whose feelings prompt him to walk up a bird or two towards evening, an intelligent Setter does much to add to the enjoyment.

Spaniels

“Every dog has its day”, and certainly most dogs have their particular duties, for which their shape and habits, and possibly their training, qualify them. The Spaniel is another most useful sporting dog. Its size enables it to hunt hedges and thickets with ease, pushing through the most difficult places, where a large dog would be out of place. And when the bird is hunted up, or the rabbit driven to its feet is persuaded to make a dash for its life, the dog's task is not completed, for should the waiting sportsman pull the trigger with result, the Spaniel hastens to retrieve the fallen game with the tenderest of mouths. For turning out game, for cleverly hunting hedges and ditches, the Spaniel is equal to, if not better than, any other.

The most popular variety of to-day is the Clumber, and this is little to be wondered at when one remembers that not only are they the best-looking Spaniels, but are also perhaps as a breed the most reliable and the most ardent workers of any. The Clumber is a big, heavily-built dog on comparatively short legs, of high intelligence, which is noticeable in its appearance, for it has a large

head and clear thinking eyes. Its silky coat is marked with lemon colouring, more particularly about the head and ears, but except for this, the purer the white of the coat the more it is liked. Its docility and its intelligence make it particularly easy to break in, and in every respect it is a worthy companion for the gun. It is the keenest of hunters, with an excellent nose, and is able to govern its actions to such an extent that it seems to understand and realize what it is expected to do.

As a breed, Spaniels are liable to be wild, and they should be carefully taught absolute obedience; but we can justly say that the Clumber is the most "biddable".

One of the oldest pure breeds is the Sussex, for even over a hundred years ago it was well known as a particular variety. It is always, *if perfectly pure*, a rich golden colour, and although perhaps rather a slow worker, yet it adds much pleasure to the day's sport, for whilst hunting it gives tongue, and merrily too. This habit greatly assists the sportsman, as it warns him that there is something afoot, and so he may be prepared for the shot. But it must not for a moment be thought that the Sussex awakens the echoes with its voice, and frightens the game out of harm's way; on the contrary, he is by no means noisy, nor is the giving tongue a loud matter.

The field Spaniels, which are divided respectively into black and "any other colour", are also a very handsome and useful breed.

The Cockers are a smaller variety of Spaniel—under 25 lb. in weight. The muzzle is rather more pointed, the body is shorter, and the legs somewhat longer than in the varieties which have been mentioned. It is a most useful type, often able to hunt places with comparative ease where even the Sussex would be under some difficulty.

The Irish Water Spaniel seems to be the only modern representative of three varieties that existed in years gone by. These were the Northern, the Southern, and the Tweed. The Tweed is said to have resembled the Bloodhound to some extent, whilst the Southerner was known as the "Old brown Irish Retriever", and its appearance can therefore be judged from this description. The present-day Irish Water Spaniel was claimed by Mr. Justin M'Carthy as having originated in his kennels, but this seems hardly probable, although it is possible that Mr. M'Carthy, to some extent, revived the breed during its decline. They are quaint-looking creatures, and certainly not beautiful; but they are never-

theless the most useful dogs for their particular work. Their coats are practically waterproof, and this is of importance for a dog that is bred for wild fowling, and must enter the water frequently, even on the wildest and bleakest of nights.

Terriers

The terriers are most useful breeds to the farmer, and even if nothing more, they are a much-needed auxiliary to various sports. The smaller varieties, the wire-haired and smooth-coated fox terriers, the West Highland, Bedlington, and the game Russell terriers, &c., are all naturally keen, able to go to ground, to badger or fox, quick and hard fighters, gifted with acute scenting powers, and remarkably plucky; their hard fighting quality, and their working capacities have made them general favourites. In the olden days, just as at the present time, they were greatly used to destroy vermin, and to face badgers and foxes, or to do any work which required particular courage and skill.

Their origin is lost in oblivion, but a very long time ago terriers were known as a distinctive breed. In the Bayeux tapestries we see a few small dogs in advance of the hounds with one of King Harold's hawking expeditions, and from their appearance we can consider that they are intended to represent terriers.

The earliest description we have of the colour of a "terrier" is in Daniel's *Field Sports*. Two kinds are there described, one a rough-coated, short-legged variety, of some length and strength, black or yellow interspersed with white marks. The other, although not so large a dog, is better shaped, and is described as more sprightly with a shorter body.

In 1803, a writer again divides terriers into two varieties, one black-and-tan, the other white, smooth-haired and smaller. From several other references of early date, it would seem that only two varieties of terriers were generally known as pure breeds. Although this was the case, there is no question that here, there, and everywhere, those interested in sport kept a particular strain of terriers and bred them true, so that at that time there were in reality many different breeds. Similarly to-day, well-known fox-hound packs have their particular terriers bred on certain lines for work.

The non-show, but typically hard-bitten breeds, some of which

have lately had classes assigned to them, such as Sealyhams, Russell terriers, Cairn terriers, &c., are nevertheless most useful, and perhaps more interesting animals than the popular wire-haired and smooth-coated terriers. There are also many pure terriers, remains of old strains that, whilst claiming no particular breed, are yet full of keen sporting instincts and other sterling qualities. And the man who is able to enjoy sport in the field or homestead, whether he is in pursuit of the badger or the rat, knows full well that a quick, alert, plucky, little short-legged terrier, a creature with much intelligence and a very large heart, is the one required. The Russell type originated from a breed kept by John Russell, a clergyman in Devonshire. The dog is one of the gamest in existence. The Sealyham, another type of sterling qualities, has been kept pure and bred for over a century in Pembrokeshire. They are short-legged, long-haired dogs, with hard, wiry coats, sometimes white, but more often marked with brown or black. There are many other sporting varieties full of grit and determination, but little known except in a particular and often very small district.

Leighton classifies the terriers according to their coats, and we cannot do better than follow his example.

1. *Smooth-coated*.—White English, Black-and-tan, Smooth fox Boston, and Bull terriers.

2. *Broken-haired*.—Wire-haired fox, Airedale, Bedlington, Irish, Welsh, Scottish, West Highland, Dandie Dinmont.

3. *Long-haired*.—Skye, Clydesdale, and Yorkshire.

The White English Terrier is a breed hardly known to-day, and very seldom, if ever, seen at dog shows, but years ago it was a well-known variety, particularly in the Midlands. In appearance it resembles the Manchester black-and-tan terrier, except, of course, in colour. It is, perhaps, rather similar to a small bull terrier. The nose is black, the eyes are set fairly close together (in the bull terrier the eyes are wide apart), and the tail, which is of moderate length, is carried high but is not upright.

The Bull Terrier.—The bull terrier's reputation for keeping bad company by associating with his master, is to-day a thing of the past. He is no longer the dog of the "bad un", winning his keep by his savage fighting capabilities. In those "good" old days the bull terrier helped to earn the daily bread of the lower sporting type of humanity. Indeed, its sole object in this world was to fight, and, if need be, die hard. Occasionally it was not a canine

adversary, but a large animal, such as a lion or a bear, that faced the bull terrier.

It is a breed of more or less modern derivation, and is the result of a blend of bull-dog blood with that of the white Old English terrier mentioned previously. Gradually more of the latter blood was introduced, and it is therefore not surprising to notice the similarity between the bull terrier and its lesser relative. Although the bull terrier is not actually an original breed, yet it is a dog of great merit, a breed characterized by hard fighting powers, stanch and true companions.

The Smooth-coated Fox Terrier.—The smooth fox terrier is a type we need say little about, for it is so well known that it requires no introduction. Hardly need it be said that it is not an original breed, but the result of all sorts and conditions of crosses amongst terriers.

To-day it is a handsome creature, standing well up on its legs, with strong sinewy neck and deep broad chest. It has a short strong back, with well-shaped muscular hind quarters, and the tail is carried as upright as possible. The coat should be smooth, hard, dense, and abundant. It may be marked with black or brown, either or both, on head and back, but white should be the predominant colour. However, liver, brindle, or red markings are not cared for, and should be avoided. It should stand, covering some bit of ground, similar to the photographs one so often sees of the show horse, rather overstretching and leaning somewhat forward.

The Wire-haired Fox Terriers.—The wire-haired terrier is very similar to the smooth-coated fox terrier, but the face of the former is rather broader towards the nose, whilst the coat, as the name implies, is longer. Very often smooth and rough terriers have been bred together, with the result that the puppies come, some smooth and some wire-haired. Hence we may come across wire-haired terriers with heads more the type of the smooth-haired variety than the one which in other respects they closely resemble. It is well to remark here that the crossing of smooth-coated with the wire-haired will probably give as result puppies with coats often as fluffy as cotton wool.

The rough-haired terriers have suffered much from the ridicule of the enthusiasts for the smooth-coated variety. That their coats are liable to become dirt-collectors is certainly true, but soap and water are cheap luxuries, and a rough mat or bundle of clean straw

saves both time and trouble. Whatever the breeders of smooth-coated terriers may say, it is nevertheless a fact that to-day the majority of people who care for the terriers prefer the rough to the smooth, and that also the popularity of the former is gradually, but surely, increasing.

The Airedale Terrier.—The Airedale is a large animal compared with the fox, or usual type of, terrier. One can hardly believe that so large a dog as a bull terrier or an Airedale is actually a terrier, and yet, notwithstanding their appearance and size, they certainly are. Years ago, the Airedale, with its large hound-like ears and shaggy coat, was an exceptionally ugly beast, but nowadays it is a very handsome creature, and a very useful one too, for although unable to enter so easily the earths of foxes or badgers, yet where conditions allow, it is by no means unterrier-like, for it will hunt a hedge as well as any, and it has considerable scenting power and great strength and agility. It is remarkably intelligent, and easily trained to rat or rabbit, or to hunt out hedges and sometimes to retrieve.

As a house dog, particularly as a guard, he is most reliable, but although a terror for strangers, it is at the same time exceedingly affectionate to members of the household whom he knows. During puppyhood, the great brute's boundless affection has often unpleasant consequences, for, being naturally a large creature, his vain or perhaps successful efforts to obtain a lick at his owner's face, whether he wishes it or not, often results in something that resembles a rough-and-tumble, much to the detriment of clothing.

In what manner the Airedale of to-day came to replace its less good-looking ancestor is of some little interest. About 1850 a cross took place between some otter hounds and terriers, and the resulting dogs were found to be of more use than the pure-bred variety. Hence within a very few years a great number were bred in this manner, and were popularly known as "Waterside terriers". After careful breeding, in which the hound characters were practically eliminated, other crosses, such as with black-and-tan, or with bull terriers, gradually made the breed what it is to-day—a deep, powerful, long-headed animal, tan in general colour, underlined with black on its body. It stands well on its legs, which are straight, with plenty of bone. One of the greatest faults to be ware of is smallness, and a good-sized dog should scale 40 to 45 lb., whilst bitches should weigh slightly less.

The Irish Terrier.—The Irish terrier is an excellent dog, a

really keen sportsman, a most sincere and faithful companion, and, above all, a good watch-dog. The thickest bushes, or the largest dog, should either offer obstruction, is no impediment to this red-coloured terrier of the Emerald Isle, for he is a square-headed and square-jawed customer, only too willing to fight, and when he attacks his adversary, he does so with such violence that he has merited the title of "Dare Devil", and during the ensuing conflict he fights with the greatest ferocity.

Although the Irish dog is said to have less intelligence than some other breeds of terriers, I hardly know whether this is correct or not. Specimens which I have owned, to the contrary, have shown as much thinking power as any other particular breed, and when it is a matter of ratting, it may well be a question whether any other breed is so expert as our little Irish friend.

The Bedlington Terrier.—Terriers are all most fascinating little beasts, and one could fill the pages of this volume with descriptions of the various breeds. Perhaps if we allowed our particular fancy to lie in abeyance, a perusal of this work would give the impression that practically every kind of terrier is characterized by "pluck", and that there seems to be little to choose between them. But the old-fashioned and odd-looking Bedlington has the reputation of being the pluckiest of all terriers. The earliest actual record of this breed dates from 1782, and refers to a dog named "Old Flint". The breed was at first known as the Northern Counties Fox terrier or Rothbury. Bedlington and Rothbury are both in Northumberland, the former being now a pit village.

The Bedlington is perhaps not a good-looking dog, having a somewhat sheepish expression. The colour is dark blue, blue and tan, liver or sandy and tan, and the peculiarity of his appearance is accentuated by the sunken eyes, large filbert-shaped ears, and over-prominent skull. The breed is of a particularly jealous disposition, and very much dislikes canine companionship. This is a disadvantage, as the presence of other dogs means a fight sooner or later. In order to prevent this tendency puppies should be trained not to fight, for once they acquire this habit, they are always "asking for it" and getting it.

Bedlingtons are often said to be delicate feeders and difficult to rear, but this is not really so. If hygienically kept, they will soon prove that they are by no means dainty or more liable than any other variety to the ills to which dogs are subject. It can only be deplored that breeders of Bedlingtons, like breeders of



POINTER, "RUMNEY KITH"

Photo: Sport and General



SETTER, "ROSE OF GERWYN"

Photo: Sport and General

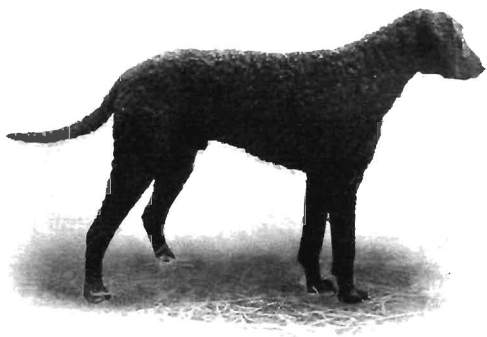


Photo. Sport and General

RETRIEVER (CURLY), "BELLE VUE SURPRISE"



Photo. Sport and General

RETRIEVER (SMOOTH), "JIMMY OF RIVERSIDE"

many other small breeds, are trying nowadays to obtain size. For ratting, for going to earth, the smaller the dog the better, so long as it is strong enough to hold its own. And also let it be hoped that, for the sake of the breed, a day will come when these interesting little terriers will be shown in their natural state, and that the breeder will be satisfied with a short-legged useful animal, and not with some well-trimmed creature of show interest alone.

The Dandie Dinmont Terrier.—Sir Walter Scott's hero, Dandie Dinmont, whose sporting terriers, we remember, all rejoiced in the names of Mustard and Pepper—the bluff and very genial Scotch farmer, whom all readers of *Guy Mannering* know so well—has given the name to this breed of terriers. And not only are they known as Dandie Dinmonts, but they are also described even at the present day as Mustards or Peppers. The colours are various, and are all recognized as some shade or other of Mustard and Pepper, the latter varying from a dark blackish to a very light silvery grey, whilst the Mustards will be found to range from a fawn to a reddish brown. The extreme colours, however, are not in particular favour, and the shades between the extremes are very much preferred. The head, which is large and strong, and somewhat out of proportion, should be of a light creamy colour; the legs short, with well-shaped feet and dark-coloured claws, although white claws are of frequent occurrence.

It is certainly a quaint-looking little dog, with its very long body and short legs, and is actually as old-looking as the breed probably is. Needless to remark, the head, though large, should not really be out of proportion to the body, nor should the legs be so short as to interfere with comfortable movements. It was formerly considered that the Dandie Dinmont should have turned-out feet in order to assist him when digging in the earth. This is, of course, a fallacy, for most animals, except moles and a few others that live underground, manage to dig remarkably well with ordinary straight feet. However, the length and weight of the dog's body is liable to force its feet outwards, and so breeders should be more intent in trying to counteract this tendency rather than develop it. The body should be long and flexible, neither too flat nor too arched. The top-knot, which is a silky covering of hair on the skull, should also not be over-exaggerated.

The Dandie is an old breed of sterling qualities, a fine hard-working little fellow, with typical terrier pluck. As a house dog he excels, being quick to catch sound, and being equipped with

a remarkably "persuasive" voice for so small a body. Like the Bedlington, the Dandie Dinmont has one rather serious fault. He is exceedingly quarrelsome, and unless properly trained from puppyhood, is over keen to have a fight on every possible excuse.

Strangely enough, Dandie Dinmont puppies are at birth very different from the adults. They are smooth-coated little creatures, black-and-tan, or else marked with a great deal of black, the former being young Peppers, and the latter future Mustards. It is advisable to breed a Mustard with a Pepper in order to prevent the colours in the youngsters becoming too light, as there is a constant tendency in this direction. A very interesting fact is recorded, and that is, that if two Mustards are bred together, Pepper specimens are certain to be amongst the litter, whilst if two Peppers are bred together no Mustards will appear. The Mendelian theory would probably explain this, like many other happenings in breeding that have puzzled the practical man so much.

The Aberdeen Terrier.—The Scottish, or Aberdeen terrier as it is generally called, is a smart iron-grey, black or brown brindle, or totally black terrier, with small piercing eyes, pricked-up ears, and a general look about it as if it certainly is very much alive. Although this breed is popularly known as the Aberdeen, yet this name is incorrect; it is really the Scottish terrier. Years ago it was generally known either as the Aberdeen, Cairn, or Scotch terrier, and this has often caused the uninitiated to imagine that each of these was a different breed in itself.

One cannot easily mistake this northern terrier, nor can it be passed without some notice, especially if we see a typical specimen standing well on its short, strong legs. It is certainly a very charming little dog. Its broad forehead and strong jaws give it a determined expression, whilst its hazel or dark-brown eyes, although so small, speak volumes for its intelligence and affection. Its 7 in. of natural tail (undocked) is held up as if its owner were about to enjoy a good romp. An excellent house dog and a cheery and playful companion, the Scottish terrier is by no means a coward. The majority of them are keen ratters and very game indeed, but unfortunately have the character of being somewhat savage.

Breeders frequently find a degenerate specimen in each litter, a spiteful, snappy, nery pup, and such a dog, if sold, usually gives little if any satisfaction to the buyer, and is also likely to make many enemies to the breed if it should be taken as a typical

example. So the nery, snappy dog, although often a fine show specimen, should neither be kept nor sold for breeding purposes.

The coat of the Scottish terrier is characteristic; it should be hard and wiry, in fact surprisingly harsh to touch, and very dense indeed. A soft, silky coat, or one that waves or curls, is a very bad fault. At the present day Scottish terriers are occasionally shown with long coats; the genuine article should have a coat not more than 2 to 3 in. long. A good terrier should not be large; dogs should weigh about 18 lb., and bitches a pound or two less. Plenty of bone is essential, for although not a clumsy dog in actuality or appearance, yet its strong bone gives an impression of great strength.

The Scottish terrier's origin lies probably in the Cairn terrier a pointed-nosed, long-bodied animal with short legs, and also in the black-and-tan wire-haired terrier, which possibly was used to improve the breed.

The West Highland White Terrier.—The West Highland white terrier is a very useful dog, and one of the real sporting kind. The muzzle in this breed is lighter than that of the Scottish terrier, in fact it is very much more fox-like in appearance. The coat should be double, the outer one consisting of hardish hair, the inner short, close, and soft, somewhat resembling fur.

They are "natural" terrors for foxes, badgers, or otters, and are most useful whenever endurance and pluck are required. Colonel E. P. Malcolm, C.B., gives an account of a young terrier that had its stomach torn open during a fight with a fox. The keeper replaced its entrails, and hardly had he done so before the little sportsman stepped back into the earth and bolted his enemy. Although this may be an exceptional case, yet there is no doubt that for pluck and fighting power, when it comes to facing badger or fox in their natural grounds, the White Highland terrier stands well to the front.

A large number of people find it difficult to differentiate between the Scottish and West Highland, but the differences are very noticeable. The colour is of course a perfectly clear matter; then again the White Highland is a somewhat smaller dog than the Scottish, and the eye is not so sunken as in the latter, but is, on the contrary, very full indeed. To-day show specimens are expected to have their eyes slightly sunken, their claws black, and their tails free from feather. These points, however, are not in favour with all lovers of the breed.

The breeding for show points, at the expense of the more

rational and certainly more valuable characters is a very great pity, particularly when old breeds noted for their pluck and hard fighting, full of that queer enthusiasm which we can hardly describe as anything else, when facing some animal often vastly stronger than themselves, are turned into mere ornaments, with a certain length of tail, black polished nails, and other non-working qualities. That breeds should be kept to a particular standard is certainly necessary, but this standard ought to be founded on the breed's natural characteristics. To the writer, there appears no sense in a breed of dogs which normally have feathery tails being transformed into creatures with a smooth poker-like appendage by means of rosin or perhaps a pair of scissors.

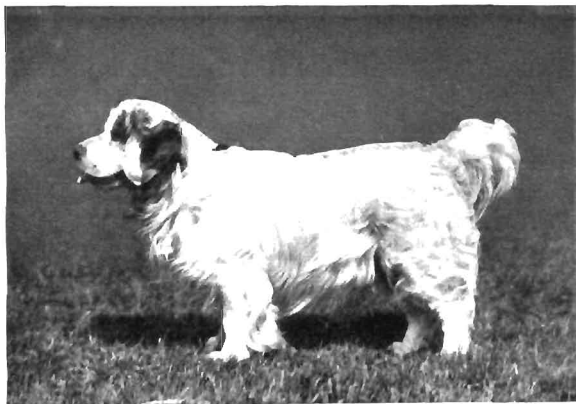
The Welsh Terrier.—The Welsh terrier is not unlike the wire-haired fox terrier in size, and also in general appearance apart from colour. It resembles also the Irish terrier in some respects, only that it is a smaller dog than the latter and also, again, different in colour. Welsh terriers are a comparatively new breed, but they have already become great favourites with many people. In colour they are black and tan, or sometimes grizzled and tan. The coat is hard and wiry, denoting a strong constitution, and a general hardiness which the admirers of this handsome little dog claim for it.

The Welsh terrier is an excellent vermin dog both on land and in water. He is highly intelligent, plucky, and also good tempered. In fact his general qualities are such as to make him both useful as a dog and delightful as a companion, and it is doubtless to the recognition of these qualities that the popularity of the Welsh terrier is due. The average weight of an adult dog is about 20 lb.

Whippets

The Whippet is practically a miniature Greyhound—a charming, graceful creature, as gentle and as affectionate as can be. Although usually so gentle, yet if much worried or interfered with it will snap with surprising suddenness and make its teeth well felt. In fact, a Whippet's bite is a very serious matter for its victim.

Whippets were formerly used for rabbit coursing; the rabbits were netted and kept until some future date, often in badly lit and dirty hutches, and on the day they were sometimes dangled in front of the dogs with the object of making the latter more keen.



Photo, Sport and General

CLUMBER SPANIEL



Photo, Sport and General

AIREDALE TERRIER. "TINTERN ROYALIST"



ABERDEEN TERRIER

Photo Sport and General



IRISH TERRIER. "CHAMPION PROVERB"

Photo Sport and General

Then at a given signal the terrified rabbit was set free, but being too bewildered by the cruelties it had suffered it was unable to move, and within a few moments was torn to pieces. The strange surroundings, its late confinement in a box, the terrifying crowd, the yapping of the dogs—all were against the rabbit; and even if it had had the courage to make a leap for its life its chances were nil, for the coursing took place in an enclosed space. Civilization, and the growing feeling that there was really not much sport in it, sealed the doom of the rabbit-coursing meets, which have now been superseded by the far more sporting and interesting Whippet races.

The course is a straight cinder track, marked at the end with white lines across the track. Instead of a single slipper, as in rabbit-coursing times, each dog is started by its individual slipper. There is a great art in giving the dog the best possible start; and up in the north, where Whippet racing is "the" sport, and is enthusiastically followed, a man who is able to accomplish this well is thought a great deal of, and is in great demand. The owners or trainers have each a piece of rag, a towel or some other cloth, and these are waved and shown to their dogs before the race starts. The cloth holders then retire to the far end of the cinder track. At the signal, the firing of a pistol, the dogs, amid much excitement, are thrown into their stride, and away they go as hard as they can, each for its respective master. On reaching the end of the course each Whippet makes a flying leap at his owner's "rag", into which it fastens its teeth. So fast indeed has been the pace, and with such force and tenacity does the dog seize its rag, that it usually swings right off its feet, and whirls round in a most astonishing manner.

Bitches are usually found to be better than dogs, and are therefore handicapped. The races are run off in heats, six or seven at a time. The entrance fees are very small, usually a shilling or two, and the prizes relatively large, £15 and upwards being nothing out of the ordinary. And as a Whippet pup is not an expensive thing to buy, and its keep is practically nothing, it is a sport that is for the poor as well as for the wealthy.

Those who keep Whippets, although aware that their dogs very much dislike wet weather, yet know that their pets are not by any means delicate, and with ordinary care they give only the minimum of trouble. They are also most affectionate pets, smart and tidy, and remarkably clean.

THE BREEDING AND MANAGEMENT OF DOGS

Everybody who wishes to keep animals in health must devote time and attention to their care, for mismanagement spells trouble, and a valuable animal if neglected soon loses its worth, sometimes never to regain it. Every stock breeder knows how show animals, bought at a dispersal sale, will alter within a very short time after being placed under normal conditions, for the appearance of their sleek coats is often the result of clever feeding more than anything else. Again, personal care or supervision is necessary, for paid employees, although they may wish to do their best, cannot have the same interest in the welfare of the stock as the owner whose losses or gains are his own affair.

Accidents so easily happen. A projecting nail might possibly result in that rare canine disease, lock-jaw; a small cut, if neglected, might lead to blood poisoning; a dry nose may be the forerunner of complications if a "stitch in time" is not resorted to. And when to apply the stitch can only be found out by careful observation of your pet. You may notice that his expression is not so bright as usual, or that he somewhat drags himself along, and seems to be altogether less active. In short, it is these little things, these slight departures from the normal, that are the signs of coming trouble, and should be acted upon as soon as noticed.

In cases of serious accident, poisoning, or disease, it is advisable, unless positively certain that you have done the only possible thing, and that skilled advice could do no more, to send for the veterinary surgeon. If medical aid is necessary, remember that the more efficient the adviser, the better the chances that your dog will have to regain its health. And should you wish to act for yourself, remember, unless absolutely confident, to look up directions, and to keep a small stock of medicines, amongst them an emetic, for a time may come when the loss of even a few moments may mean the death of your dog.

KENNELS

As to kennels, they should face south, placed so as to escape draughts, and be sufficiently sheltered from wind and rain. If possible, arrangements should be made for the dog to retire and

find shade when the weather is very hot. As dogs suffer much from rheumatism, care must be used that the kennel is not placed in a damp situation, and the inner or sleeping room will be all the safer and drier if it has a wooden floor raised a few inches from the ground. This, however, has the disadvantage that dust and vermin are liable to accumulate beneath the floor and in the cracks. Should fleas collect beneath the floor, an application of paraffin will give the desired result. In front of the kennel a cement floor surrounded by iron railings is very advisable for the run; it can be kept perfectly clean by occasionally washing down. Asphalt is liable to get soft during hot weather, whilst stone becomes both hot in summer and very chilly in winter.

There are all sorts and conditions of kennels, to suit various sized dogs, and big and small pockets. The smaller box kennel with a miniature run attached is not to be recommended, for the run is usually far too meagre for even the smallest dog to obtain sufficient exercise therein. But even this diminutive run, although not allowing free exercise, has one great advantage, and that is, that the dog need not be chained up. If the writer's feelings can somewhat replace those of a dog, he would far prefer to run about at the end of a 6-ft. chain than to have an area of 6 by 4 ft. to turn round in. For dog breeders, the lean-to kennel, similar to a loose box, with covered run attached, is one of the most useful, and is not expensive. Where there is ample stabling, a loose horse-box, with plenty of straw, is an ideal home for any dog.

BEDDING

At the present day there are beddings of various kinds on the market, some of which are guaranteed to keep the dog free from vermin, &c., but in the writer's opinion clean wheat straw takes a great deal of beating, and there is nothing most dogs like so well as this material. It must also be borne in mind that in most places, if not everywhere, this commodity is easily obtained at a reasonable price.

The great thing is to keep the dog clean, for it is naturally a cleanly animal, but if kept in dirty surroundings, it is liable to degenerate and become a refuge for all sorts and conditions of vermin. Kennels and outside runs should be thoroughly scrubbed down with water, and washed with a disinfectant, such as Cylin and Jeyes' fluids, and it is wise to remember that a small clean bed is far better than a kennel full of wheat straw.

Many breeders, however, prefer that their dogs should sleep on the boards and use no bedding of any kind, whilst others advise a rough mat or a sack. Although bedding is certainly not indispensable, it has the advantage of saving the dog rubbing off its hair on the boards, and keeps it warm during the cold nights of winter.

Dogs should be taught to behave in their kennels as they should in the house, and this, like many other things, is simply a matter of training. An additional preventative, if once the dog has soiled its sleeping compartment, is to sprinkle a little pepper on the boards.

Every dog ought to be kept clean, free from fleas and other torments, not only for its own sake, but also for that of the human beings with whom it comes into contact. A clean kennel, clean bedding, and lastly, a clean dog, is all that is required, for once cleanliness is the rule it is not difficult to keep matters so. Although washing a dog is said to make its coat soft, yet it is often a necessity; and if it is well done and the management is correct, the dog will remain free from vermin for a great length of time. Always soap well, and be not afraid to rub as hard as you like. Start soaping just behind the ears, to prevent fleas saving themselves by escaping into the aural cavities of their host. A weak solution of Jeyes' or other disinfectant is handy if mixed in the bath. Several changes of water are advisable in order to rinse out the soap. Old towels come in very handy for drying, and if a loose box with plenty of clean wheat straw is obtained, a dog will be only too willing to dry itself by rolling and rubbing in the straw. Care should, however, be taken not to allow the clean dog too much freedom till safely placed in the box and the doors are ready to be closed, or else, perhaps out of pure "cussedness", it will choose the dirtiest spots on which to roll, and within a few seconds be the most dirty dog imaginable. A well-trained small dog, such as a terrier, will stand quietly in a tin bath and show no ill temper nor any signs of discomfort.

It is hardly necessary to say that house dogs should be kept scrupulously clean, for otherwise not only may the dog introduce various obnoxious diseases, but may bring vermin into the house. It is a common fallacy that the dog flea (*Pulex canis*) will not thrive on man, but those who are under this impression should try one and see. Large dogs which are difficult to wash may be sponged over with a solution of Jeyes' fluid; this will get rid of fleas. Keat-

ings' and other insect powders have the same desired effect. To clear a dog of lice, Hunting recommends the following solution, to be made into a lather all over the dog's body by adding warm water:—

Soft soap	...	...	1 lb.
Rectified spirits	...	(enough to dissolve the soap).	
Creosote	...	...	1 oz.

EXERCISE

A dog requires plenty of exercise, the more the better; and not only is it cruel to keep it on a short chain from one year to another, but it is also very likely to lead to various troubles. If it is necessary to keep a dog on a chain, the latter should be long enough to allow plenty of room for movement. Where possible, a chain of 12 or 18 ft. is very desirable. As an ordinary long chain is liable to get entangled, a chain with swivels at short distances, particularly if it is a heavy one on the kennel end, will be little or no trouble in this respect. Spratt's stop-link spring is a very desirable addition, for it saves jarring the dog's neck when it comes suddenly to the end of its tether. But this is by no means a necessity, for after a very short time the dog learns, only too well, how far the chain will reach, and takes care not to outstep the limit.

Exercise is essential for both adults and pups, but with youngsters it should not be overdone. Large puppies, such as Newfoundlands and Great Danes, should never be taken for long walks, but allowed to take only as much exercise as they wish, otherwise they are liable to tire and become misshapen. Unfortunately, puppies usually choose the most-prized rose bed in which to dig a retreat, otherwise the best method is to allow them the run of a garden. Adult dogs should be taken for walks or runs, and, if sportingly inclined, rattling excursions do much to keep up good spirits.

The practice of allowing a small dog to race behind a cycle is sure to lead to accidents one day or another, and not only that, but is very cruel, and likely to result in heart trouble. If the owner is an ardent cyclist, he ought to bear in mind that his little companion is not on wheel, and that running fast on hard roads must be exceedingly painful. Judicious road exercise is an excellent thing for the dog's feet, as it tends to harden them, and if the cyclist goes very slowly, and does not forget his dog, no harm will result.

How much exercise is required depends on the age and species of the dog. A Greyhound will require more to keep it fit than a Toy dog, whilst the kind of exercise necessary for a Bulldog is very different from that suited to the Greyhound. Then, again, old dogs, like pups, should not be tired by long walks.

There are several methods of exercising a dog with the minimum of trouble. A thick cable wire stretching from the kennel to any distance, on which the chain is threaded, will allow the dog to run to and fro if it so wishes. Again, a tempting morsel hung at a height just out of reach of the animal will have the desired effect. The writer feels that, if anyone intends to keep dogs, he or she should arrange to have them properly exercised, or else rather do without them. To recapitulate, never overexercise a dog, either by distance or by pace, and always bear in mind the species and age of the animal in question.

FOODS AND FEEDING

The dog, as we have seen, although a member of the Carnivora is practically omnivorous. Hence the diet may be a mixed one, containing farinaceous food as well as flesh. At the present day, dog biscuits containing meat or fish are the staple diet of most dogs, but this should be varied with scraps of meat and vegetables. Amongst the latter, well-cooked young nettles, turnip tops, and cabbage leaves are all excellent when mixed with meat. Potatoes, however, should not be given in too great quantities. Butchers' scraps, which consist of oddments of meat, bones, sheep's heads, &c., are all good and most desirable foods if used judiciously. It is advisable that all meat, except when given as a tonic, should be carefully cooked; sheep's heads are particularly dangerous, unless they are thoroughly well cooked, for they often contain the cysts of tapeworms, which have the dog for their final host.

Horse flesh makes an excellent food, but should be used in moderation and carefully cooked. Bones are most beneficial to puppies and to adult dogs alike, for during puppyhood large bones help the teeth, whilst digested they help to build up the puppy's frame. An outside cooker is a most useful appliance where many dogs are kept, and several most excellent ones can be obtained at a comparatively small price.

Underfeeding of puppies means stunting their growth, and it is liable to make them rickety as well as unhealthy in other ways;

a starved dog will also learn to steal, to kill poultry, and to eat up any filth that it can find, and these habits are often difficult to break if once established. Hence the importance of keeping dogs sufficiently well fed. They should, however, not be overfed. The uneaten remains of previous meals should not be allowed to lie about the kennel. Although dogs have an excellent digestion, they are liable to many ills if injudiciously fed.

The feeding should be regular. As to the quantity of meals, most breeders have their own methods. Two meals, one in the morning and one towards evening, are quite sufficient. Some advocate a single meal each day, but this seems hardly enough.

Another moot point is whether to give biscuit to a dog soaked, scalded, broken, or whole. As it happens, some dogs prefer their biscuits soaked, others dry; some, again, will manage a whole biscuit, whilst many others will not touch one unless it is previously broken for them. So, how the biscuits are given will largely depend on the dog, and what the result may be.

Let it be remembered that bad feeding will lead to eczema and general ill health, and that it is a mistake to expect dogs to find their own food, as the writer has found to be the rule on many farms. The result is that the miserable, hungry animal must find subsistence, which can only be the remains of dead animals; and should there be none such, the dog is driven to kill sheep, poultry, or game, in order to find a means of livelihood. Again, sheep-worrying would not be of such frequent occurrence if people who keep dogs realized that their dogs require plenty of food, and that the quantity depends on their respective sizes. Apart from these results of a system of "find your own food", the owner should be aware that, by allowing his dogs to scavenge, he lays himself open to various diseases, not only in his own household, but also amongst his live stock.

As to patent foods, they are often most reliable, and are particularly valuable for dogs which are dainty feeders, or for motherless puppies, or as diet for invalids. It must, however, always be borne in mind that the more naturally a dog is kept, the better will be the result in every way.

There should always be a sufficient supply of water within reach of the dog, especially during hot weather; or it may be replaced by milk, particularly goat's milk, which is an excellent food.

DOG BREEDING

Great care should be taken to start on the right road in dog breeding. A bitch of the best possible strain should be obtained, and should be judged not only by her looks, but by her predecessors. The same care and judgment should be exercised in choosing the dog, and his pedigree ought to be well enquired into. Such points as whether he comes of a working hard-bitten strain in Terriers, or whether soft-mouthed in Retrievers and other shooting dogs, and good-tempered in the larger breeds, ought to be considered. It is so often found that puppies will throw back, in fact that they have the characters of remote ancestors possibly far more strongly marked than those of their parents; and the man who wants to be successful in dog-breeding would do well to remember that a cheap thing means always a cheap thing, and that it is wiser to pay a larger fee for the right dog than to save a small sum and breed from a less useful type or into a poor strain. In every line of live stock the best animals will always sell, whilst poor stock is exceedingly difficult to dispose of.

If you wish to strengthen any particular point or character, you can do so by inbreeding. That is to say, should a particular line of Terriers have been expert vermin killers, and have had noticeably short legs, and you require Terriers with these characters equal or somewhat intensified, a dog and a bitch of this blood mated together will be likely to give the desired result. This inbreeding may be carried into effect by *mating a daughter with her father, mother with son, cousins, or sisters and brothers together*. But inbreeding has one particular risk, for just as the required characters are intensified, so likewise will the faults, and so much more will the puppies be susceptible to the diseases to which their parents may have a tendency. Hence, when inbreeding is resorted to, great care must be used, and dogs from rheumatic strains, or those who have shown in the past that they are liable to any particular ailment, should not be inbred. Cousins, or the parent with the child, are the safest, whilst a brother and sister cross is the most dangerous. Generally, judicious mating of various strains is far more satisfactory, for by this means, if good judgment is used, the breeder can subdue or intensify any particular character that he may require without the risks which attend the breeding from close relatives.

A show Terrier that has the fault of being too long in the back



Photo: Sport and General

WIRE-HAIRED FOX TERRIER—"GYPSY MOTH"



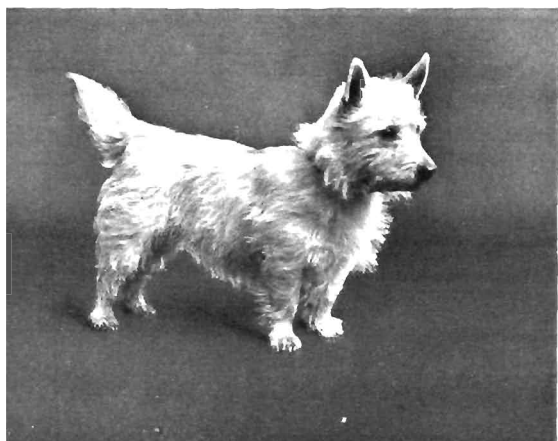
Photo: Sport and General

SMOOTH-COATED FOX TERRIER—"YEOVIL STAR"



DANDIE DINMONT TERRIER

Photo Sport and General



WEST HIGHLAND TERRIER. "RUNAG"

Photo Sport and General

should be crossed with one that is slightly shorter than the type required; and even should the youngsters not themselves actually show the result, they at least have it in their blood, and on some future occasion it is certain to reappear.

Over-fat dogs are less likely to breed than those in working condition, and pampered specimens are particularly liable to be sterile, or, if they should breed, to suffer from various ills and produce unhealthy pups. It is important to mention here that worms are the greatest trouble to the dog breeder, particularly in the young pup. Every bitch before being bred from should be cleared of worms, and it is advisable that the dog should be treated likewise. Subsequently, when the bitch has gone three weeks, she should again be dosed, otherwise there is some danger that the pups may be born wormy, and not only be greatly handicapped but live most miserable lives.

The feeding of the bitch should be rational, bearing in mind that from the first she is not only keeping herself but her future family, and so requires sufficient good and nourishing food, particularly that containing phosphates (i.e. such as crushed and boiled bones), in order to do well. It is essential that she should have plenty of exercise, and should be treated as if under ordinary circumstances, although the breeder must naturally use his common sense and prevent the bitch becoming over-excited or squeezing beneath gates or otherwise injuring herself. Towards the end of her time a dose of castor or salad oil should be given, and it is now advisable to exercise her on a lead only.

Most bitches will have little trouble, and, as a rule, will do far better if they are not interfered with, but in the case of a valuable bitch, the owner should be present, so that if things do not go as well as they should he can assist, provided he understands the work, or else go for skilled advice. The bitch should be given a nice clean bed of wheat straw, and a bowl of fresh milk or sufficient clean water ought to be within easy reach. Great care should be taken not to excite her, and she should be left undisturbed.

Usually all goes well without man's aid, particularly if the bitch has been properly fed and exercised during pregnancy and not pampered and fed on sugar or other tit-bits; but it is as well to be prepared for emergencies, and to have at hand a bottle of disinfectant, some brandy, chloroform, and ergotine, and last, but not of least importance, a sharp pair of clean scissors. The uses of the above all dog breeders know only too well, for it sometimes happens

that if a bitch has had a great deal of pain she may be so weakened that she is unable to expel her puppies. A dose of 10 drops of ergotine in a teaspoonful of water will greatly assist her. (This dose is for a bitch the size of a very small Fox Terrier.) It sometimes, but very rarely, occurs that the umbilical cord does not break naturally, in which case it should be cut with the scissors.

However, it cannot be too strongly impressed on the amateur that the less interference the better, and if it is actually necessary, not only must the nails be cut close, but both hands and implements must be perfectly clean. A pup may occasionally require to be given a start in life, and in order to induce breathing, a practically lifeless puppy may be given a drop of brandy and patted or put into a warm bath; sometimes the warmth of a fire will have the desired result.

REARING OF PUPPIES

Occasionally puppies are born prematurely. This is often the result of bad management, such as lack of exercise and over-feeding. In such a case it is advisable to allow the bitch to go over a period without breeding.

When the puppies are born and everything is correct they should be left to the entire charge of their mother, who knows full well her duties to her family. The number to leave with the dam will depend on the condition of her health, the quantity of milk, and also on the size of the pups. Some bitches have extraordinarily large families, far too many for one mother to rear successfully, but it is a great mistake to reduce litters too much. However, as an over numerous family is likely to pull down the bitch, the owner must judge for himself as to the best number to leave with the mother, and so, when breeding valuable dogs, it is advisable to have a foster-mother in readiness to take some of the family. This, which can be obtained from one of the firms dealing in fosters, should be if possible of the same breed and of practically the same size as the parent of the pups. Most bitches will readily adopt the strangers, but some care should be used, and, if possible, the deed should be done after dark, the new-comers being pushed beneath her own youngsters, which should be removed one or two at a time. It is, however, very important to take her own family out of ear-shot, and provided the change has been carefully effected, everything will be smooth sailing. Amateur breeders often keep all

the puppies, sometimes even the maimed, the halt, and the blind, but it is obviously a bad plan, for a deformed puppy can never be of much use, and is far better destroyed at an early age.

If a bitch is found to have an insufficient milk supply she should be given plenty of cows' milk, made into gruel with corn flour. In cases of emergency, such as after the death of the mother and the absence of a suitable foster-mother, the puppies can be kept alive with a bottle of milk and various farinaceous foods, such as Mellin's, Benger's, or Nestlé's, which should be given warm out of an ordinary feeding-bottle. The bottle and rubbers, &c., should be kept scrupulously clean, and scalded out immediately after use. The puppies should be fed frequently, every two hours if possible, and they should be kept in a warm room in a well-lined basket. As hand feeding is a most tedious task, it is always advisable to send for a foster-mother immediately. Advertisements of such in *Our Dogs, Exchange and Mart*, &c., may constantly be seen.

The rearing of puppies is a simple matter. The mother should be well fed, and as soon as her family is old enough they will only too readily join in the feast. Plenty of bread and milk, cooked vegetables, and puppy biscuits are all that is necessary, but they should not be given meat, although clean bones are essential.

CARE IN MATING

It is a great mistake to breed from bitches too young, and it is certainly unwise to mate animals that are not mature. No bitch ought to be bred from under twelve months old, and it is preferable to wait until she is eighteen months. An important matter is to arrange to have the puppies born in the early summer, and never, if possible, in the autumn or winter, so that they may have the advantage of warm weather for the first stages of their growth.

It is an interesting fact that bitches are often by no means indifferent as to the fathers of their pups. In fact, some bitches will refuse a dog that in some way or other they do not fancy. The healthiest and largest litters are bred when the bitch actually cares for her consort.

When a bitch is in season she should, if possible, be kept in a building up steps, for this will do much to prevent numerous dogs congregating, and if by accident a bitch is served by a wrong dog she should be immediately syringed out with a strong solution

of alum in water or Condy's fluid, containing 5 g. of zinc sulphate to each ounce of the liquid. The Condy's fluid should be a fairly strong solution, but either of these mixtures will be found to give satisfactory results if used in time. It often happens in the best-regulated kennels that a bitch may be served by a dog of another or of no particular breed, and many are of opinion that this may spoil the bitch for future litters. There is, however, no satisfactory evidence that bitches are in any way marred by accidental matings of this kind so far as future litters are concerned, or that a bitch that has bred to a mongrel may not breed true from subsequent matings.

TRAINING

A badly trained dog is by no means a pleasure, and the better in hand and the more obedient the animal is, the more useful it is and the more agreeable is its companionship; the happier also is the animal itself.

The schooling of the puppy should begin at an early age. kindness and patience will soon teach it to "Come here" when bidden, and it should never be allowed to do contrariwise. Should it for some reason or other refuse to come, the owner must not give in, but must keep on calling it, drawing it nearer by hook or by crook. But usually there is no difficulty, for every real puppy loves to be made a fuss of. To answer to the whistle without a moment's hesitation is the next lesson to be learnt. A dog of one year old can be treated a little more harshly when it disobeys, but little puppies do not require much to frighten them, a gruff word or a shake of one's finger meaning undreamed-of terrors.

To teach a puppy to "Lie down" when told, gently force it into that position by lightly pressing on it, or else, if it is a large dog, by pulling its legs away from beneath it until it reclines. This should be done time after time, and on each occasion, when the puppy is bending down, the owner should hold it, and by gradually releasing his grip, allow it to rest without interference. As soon as it starts to rise it should be firmly but gently replaced and told to "Lie down".

To drop food on the command to "Drop it", is an exceptionally useful trait in a dog's character. It may save poisoning, and it certainly saves any amount of trouble. A dog may pick up a piece of decayed meat, and, unless it has been properly trained,

it will result in a wild race between him and his master, a most vexatious affair. When the dog has been properly trained, the owner has but to say "Drop it" and the dog obediently complies with the order. In training the dog, use some hard substance, such as a piece of biscuit or a bone, and on the words "Drop it" force it to relinquish it. Then give it to the dog again, and continue this performance until at the words the animal obeys. The writer has found, from much experience, that a scolding voice, when training, does more than thrashing. The latter should only be resorted to on grievous offences, such as continued uncleanness in the house, destroying poultry, &c.

When a dog barks, it is wise to pay some attention. If there seems to be no cause except the pleasure of hearing its own voice or answering some other, it should be scolded and told to be quiet, but if it barks at strangers, even if they are particular friends of yours, it should not be admonished, but encouraged.

To train a dog to attack an intruder, or to protect its master, is no difficult matter if the dog is naturally plucky. The best time to start training for this purpose is when a bitch has puppies. Shuffling of strange feet towards the kennel will excite her. The shuffling should never result in scaring the animal, but should only act as an irritant. The owner then goes up to the bitch in his usual manner, closes the kennel door, and strokes and talks to her. In the meantime some stranger should shuffle along the yard towards the door. The owner "sisses" very softly to the bitch to force her attention. As the shuffling comes closer a hand ought to be laid on her collar, or she should be held by the scruff of the neck. On no account should the master speak to the stranger, but he should behave as if on the alert. After several lessons of this kind, someone shabbily dressed should shuffle towards the door and very gradually open it, as slowly as possible, the owner holding the bitch by the scruff of her neck and very quietly exciting her. The stranger should then retire without rushing at her or in any way frightening her, and without speaking either to the bitch or to the owner. The next lesson is to take the bitch on a lead, after previously arranging that someone suitably dressed should advance suddenly from behind a building and shuffle towards you. The bitch should be encouraged to the uttermost. On subsequent lessons the stranger should use a stick and hit on the ground around her, but making certain never to hit her.

To whatever you wish to train a dog never break its confidence,

and never lose your patience or be beaten. A future badger digger, if put to ground too young, or a puppy if badly bitten by a rat, is likely to lose all confidence in itself, and possibly be spoilt, whilst if the dog is old enough to hold its own and win, the contrary is the result.

In training a puppy remember that you are dealing with a child-like creature which cannot easily remember what it is told, nor understand at first what is actually required. Every little effort in the right direction should be rewarded by a few kindly words, and at the end of the training a good romp and a big fuss make both master and pup forget all the trials and troubles of the past.

In teaching a dog to behave itself in the house, do not expect impossibilities. The pup must be taken out of the house every few hours when of very tender years, and even then accidents are certain to occur. To thrash the poor thing on these occasions is nothing less than cruelty. Rather allow the pup to live in a loose box or backhouse until six months old, then it can be taken into the house and one can expect fewer annoyances, assuming that the youngster is looked after. It should be let out for exercise last thing at night and first thing in the morning, and care must be used that the pup is put out immediately, and not allowed to wander about the house before making an exit. Should it misbehave itself, scolding with its nose placed at the required spot, and subsequently the application of pepper to the locality, will often prevent further nuisances. Dog owners should do their utmost to make the existence of the intelligent and highly sensitive dog a happy one. For kindness and good treatment, there is no animal that can show in return such whole-hearted devotion as the dog.

DISEASES OF DOGS

In a work of this kind it is of no value to deal with diseases which require skilled veterinary advice, or where the use of surgical appliances is a necessity. But it so often happens that some little thing occurs, such as a few grains of poison inadvertently taken, some sudden injury, or some slight indisposition, which could be easily rectified if only the owner knew what to do, and so "what to do in case of emergency" must really be the subject of this section.

How to tell if a dog is ill needs little explanation, for usually

it is only too obvious. A dog that refuses its food, mopes in a corner and seems uneasy, is certainly not well. The nose is a good and reliable health indicator. It should be cold and somewhat clammy in the case of the healthy animal; a hot, dry nose either means that the dog is thirsty, or that it is unwell. But it must be mentioned that some dogs, even though healthy, have particularly dry noses. Yellowish eyes are a sign of liver trouble; reddened membranes, especially on the under side of the eyelids, are a sign of inflammation, whilst a staring coat usually means serious trouble. In short, any unnatural condition, whether it is peculiarly cold ears, or equally overheated, all lead to one conclusion, and that is that the dog is not in a normal condition.

Some peculiarities are the result of circumstances of little import, and must not cause alarm. For example, a dog will pant on a hot day, or in a warm room, and after a long chase; or again, it may make *most peculiar nasal sounds which imply nothing worse than an obstruction, usually only temporary, of the nose.*

But if the owner is unable to decide whether the dog is seriously ill or not, although this usually allows no doubt, he can take the animal's temperature. The normal temperature varies from 100° to 101° F. A high or abnormally low temperature would, of course, imply ill health. The temperature should be taken per rectum, with a $\frac{1}{2}$ -min. clinical, and great care must be used that the thermometer is not broken. Should a dog show signs of being unwell, it should be carefully felt all over, walked about, and the parts of its paws firmly pressed, its abdomen gently fingered, to ascertain, if possible, if there are bruises or swellings of any kind.

Although it may seem rather unscientific, yet the writer thinks it is a safe method to give the ailing dog a purgative, unless there is clear reason for not doing so, or the trouble is discovered to be sore feet or other such matter. When giving liquid medicines, place the left hand round the muzzle, so as to have control of the dog's mouth, then pull down one side corner of the lip and place the medicine in the natural funnel thus produced, slightly loosen the grip on the mouth, without losing proper control, and the deed will be done. Always be kind, a little confidence goes a long way, and rough treatment may end in the patient choking or in some other ill. Never hold the animal between your knees, and after having given the medicine, be careful that it is not immediately vomited again.

•

Medicines in the form of pills are the most simple to give, and the dog should be placed in such a position that it is unable to draw away (such as back to a wall); the mouth should be opened and the lips bent over the teeth, to prevent the animal biting. The pill should then be taken between the two first fingers and pushed to the back of the tongue—in fact, if possible, actually into the œsophagus. This done, the mouth should be firmly closed. Usually the pill has by this time reached its destination, but in case there is any doubt, a touch on the throat will no doubt force the dog to swallow with the desired result. Remember to hold the dog's head well up. Powders, particularly tasteless ones, can be mixed with food and will be readily taken, particularly if the medium of concealment is a luxury, such as a piece of raw meat.

A few of the commoner diseases of dogs are very briefly dealt with below, and, for convenience, they are arranged in alphabetical order.

Abscess

Great tenderness to touch, and sometimes swelling, are the indications which cause one to suspect that an abscess is forming; there is fever often present, and the dog shows signs of being in pain. Bathe with hot water, and apply poultice if the position allows. If absolutely certain of abscess, and that it is near the surface, a clean cut at the bottom of the abscess (so as to prevent a bag forming) with a sterilized razor, just large enough to let the "matter" off, may be made. Wash out with disinfectant. To prevent the surface part healing before the internal, if the abscess is found to be deep when opened, keep the upper part of wound open with a pad of sterilized or clean lint. Feed carefully with bread and milk.

Amaurosis, or Glassy Eyes

The dog loses sight to some extent; the pupils are much dilated and staring, and the animal seems typically drunken. The amateur can do little, and the veterinary surgeon should be consulted.

Anæmia, or Poorness of Blood

The gums and mucous membranes become unnaturally light-coloured; the appetite is indifferent; the bowel action frequently bad. The patient should have plenty of sunshine, fresh air, and

good food. Tincture of iron or syrup of phosphates may be given in doses depending on the size of the dog.

Anus Prolapsed

The bowel protrudes, and is usually painful. The treatment is simple, consisting of replacing the bowel, and stitching if necessary. It is advisable to send for professional assistance.

Apoplexy—Fits

Keep the dog quiet, and do not be afraid of it. Professional advice should be sought.

Asthma

This is usually the result of improper feeding. Do not excite; feed carefully, and beware of starchy foods. Send for the veterinary surgeon if there is no improvement after a reasonable time.

Biliousness

Vomiting, yellow frothy secretion, nose warm, &c., are the usual symptoms. The best treatment is to give a purgative.

Bites. (See WOUNDS)

Blain

This is a contagious disease marked by swelling on the tongue, with vesicles. It is frequent in the early part of the year. Give a purgative; open the vesicles if necessary. The food should be light; milk diet is recommended.

Blotch

Sores on the body, with a thin discharge. Try glycerine diluted with water; rub in well two or three times daily.

Bowels, Inflammation of

The animal will be in great pain; feverish; vomiting occasionally. Send for veterinary surgeon immediately.

•

Bronchitis

Typical cold, wheezing, shivering, &c. Breathing often bad; cough usually present. Use gentle purgative at first; keep warm; and procure bronchitis mixture from veterinary chemist, or, in bad cases, send for the veterinary surgeon.

Canker of the Ear

The dog shakes its ear; frequently it holds its head on one side as if the ear was painful; it constantly scratches its ear and whines while doing so; a nauseating smell can be noticed.

The case should be taken in hand immediately, for a stitch in time saves nine. Give a laxative; feed the dog well, giving plenty of vegetables; give tonic pills, such as sulphate of iron, sulphate of quinine, and extract of dandelion. Use hot poultices, but be very careful that no water gets into the ear. Should the disease become worse, make a weak solution of permanganate of potash and use warm. Wash out carefully. In bad cases, mix 1 oz Goulard's lead extract, and $\frac{1}{2}$ oz. carbolic acid in glycerine (1 pure to 5 pure), and then add, drop by drop, $4\frac{1}{2}$ oz. of olive oil. Rub the mixture well together with pestle, then bottle. The lotion must be carefully shaken before use, and a little should be frequently poured into the ear.

Choking

This may be due to chicken bones, splinters, fish bones, or other obstruction in the throat. This is of frequent occurrence. Carefully cover the teeth with the lips (clean hands with short finger nails are essential); remove obstruction carefully, if possible without damage to the tissues; if unable to do so, send to the veterinary surgeon. In case of great emergency, risk using forceps, if possible covered with thread and oiled, or with a well-padded stick to push obstruction downwards. Be careful to grease well the pad and sides of carefully covered stick, to prevent scratching the throat.

Colic

This is a name that is often given to any trouble of the bowels. Find out cause by looking for such symptoms as absence of normal action, dry nose, staring coat, &c. If movable, use purgative such as castor oil. If the dog is suffering much, 5 to 30 drops of tincture of opium will relieve the pain. Hot flannels may also be applied.

Constipation

A dose of castor oil with plenty of exercise will in ordinary cases cure this. A swim is often beneficial. Rectify the feeding.

Diarrhœa

This is often due to hot weather, bad water, bad food, or improper feeding, such as too much wet food. The treatment depends on the cause, and if the case is not serious enough to call in professional aid, a dose from the chemist will often have the desired effect.

Distemper

Distemper is the bane of dogdom. Careful nursing, keeping the bowels open, keeping the dog quiet, dry, and warm are all essential. Feed on beef juices, peptonized foods, milk, infants' foods, and anything easy to digest. In bad cases, a veterinary surgeon should be consulted. Preventive pills, which may easily be obtained, are very useful.

Dyspepsia (Indigestion)

Change the diet; give more easily digested foods, with plenty of fresh air and exercise; give a light purgative also, and beware of all dainties.

Eczema

This is a skin disease not uncommon in dogs, and one which, fortunately, is not infectious. It is marked by constant irritation and soreness; skin red in places, with the hair rubbed off; inflammation; and the skin becomes wrinkled. Usually the disease appears first on the base of the tail, or the face, such as on the nose or above the eyes; it is also often found on the belly. At first it resembles flea bites; the spot becomes larger and forms vesicles, which burst and give out a fluid (weeping mange). In dry mange no fluid is present. The dog scratches himself incessantly. The disease is due to improper feeding, worms, or possibly to parasites, dust, &c., irritating skin.

Dust the dog over with a mixture of zinc oxide 1 part, and starch 4 parts, or rub over with 1 pt. olive oil mixed with 2 oz. oil of tar. Give 1 oz. Epsom salts, 1 dr. liquor arsenicalis, 2 dr. tincture of ginger, mixed with 6 oz. of water, in doses, night and

morning, of a dessertspoonful for small dogs, and a tablespoonful for large dogs, after food.

Feet Sore

Bathe with water, apply borax lotion, or wash the feet in Jeyes fluid solution, 1 to 40. Zinc lotion is also excellent.

Mange

A parasitic disease, usually very contagious. Isolate the patient immediately the disease is suspected, and apply one of the various recognized treatments to kill the parasite.

Milk, or Puerperal Fever

This is a most serious disease. One or two days after pupping, the bitch seems to be unwell, and takes little notice of her pups. She will lie down and remain in a sleepy, unhappy condition. Sometimes she will vomit or lie shivering. There is a dark-coloured and fetid-smelling discharge from the vagina; very high temperature, often reaching close on 106° F. After twelve or thirty hours, the poor creature is either dead or greatly improved in condition. The only thing that can be done is to syringe out the uterus with a 1 to 2 per cent solution of creolin. Give small doses of castor oil, stimulants, &c. Be careful not to carry the disease to other dogs, either by hands, clothing, or implements.

Remove pups to foster-mother or hand feed. (See p. 142.)

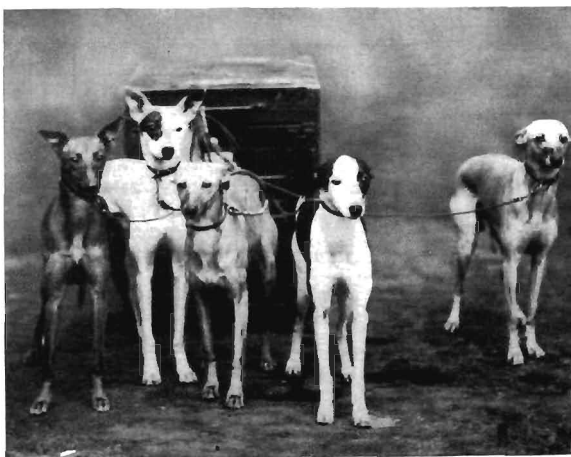
Poisons

If the kind is unknown, use emetic immediately; a very weak solution indeed of copper sulphate in water, only just coloured, will answer the purpose; ipecacuanha wine is also useful. If none of these emetics is handy, produce vomiting by any possible means. Try very soapy water, mustard and water, pieces of rabbit skin, either or all. Remember there is every hurry to make the dog sick. Reproduce vomiting until certain that the stomach is empty (a few drops of the copper sulphate solution will have the desired effect). Sulphate of zinc, 5 to 20 gr., is also an excellent emetic. It is advisable in all cases of poisoning to send for the veterinary surgeon.



BULL TERRIER. "KRISHNA"

Photo Sport and General



WHIPPETS

Photo Sport and General



The commoner poisons are the following:—

Arsenic.—Frequent in rat poisons. The symptoms of arsenic poisoning are, depression followed by violent pains in the abdomen and throat; loud and hard cough; intense thirst; frequent sickness and vomiting of brownish fluid; diarrhœa. Use emetic; give drink of soapy or salty water, followed by strong doses of magnesia. Send for the veterinary surgeon.

Carbolic Acid.—Great pain; shivering; sickness; total collapse. Give olive oil or white of egg, and surround the dog with hot-water bottles. It is beneficial to give the dog a hot bath and keep rubbing it all over. A stimulant, such as brandy in small doses in milk or water is useful.

Corrosive Sublimate (Tartar Emetic).—Give plenty of white of egg, and, if possible, immediately afterwards an infusion of oak galls.

Lead.—Emetics, followed by a solution of Epsom salts in hot water, should be tried; hot-water bottles near the stomach, care being taken not to have them too hot, are also recommended.

Opium.—Emetic; strong coffee drinks.

Phosphorus.—(From rat poisons, &c.) As an antidote give calcined magnesia. Give oils or fats (liquid or ordinary butter will do).

Strychnine (Nux Vomica).—Continual emetics, followed by plenty of olive oil, butter, fat, or lard, are recommended. Keep warm with hot-water bottles, poultices, &c.

Rabies

This corresponds to hydrophobia in man. At the present moment rabies does not exist in this country. The dog hides away from the light, and seems peculiarly irritable and sulky; foams at the mouth; gives every symptom of violent pain; bites at everything within reach; often swallows stones, sticks, &c.; and snaps wildly at phantom objects. The dog is suffering agonies, and bites involuntarily, and has no wish to injure anybody or anything. It is a very dangerous disease for man and live stock, for it is easily transmitted by the bite of an infected animal. The dog should be destroyed without delay.

Rheumatism

This is a very common ailment in dogs, and the patient shows all the usual signs of this trouble. Keep the dog in a dry kennel, and feed well on light food. He should always be dried after getting wet.

Rickets

A disease of young dogs due to feeding on foods deficient in lime and salts. Keep on the mother as long as possible. If weaned, give bones (crushed or boiled), and plenty of other food. Fresh air and sunshine are essential.

Ringworm

The hair comes off in patches, and the bare places get covered with scales. It is contagious, and easily caught from, or given to, other animals. Usually it is a sign of bad kennel management. Iodide ointment should be rubbed in twice a day. Also, oleate of copper 1 part, and lard 4 parts, make a very useful application. The affected dog should be isolated.

Worms

The most common and pernicious disease of dogs. There are several species of worms that affect dogs, including tape and round worms. The best thing is to use one or other of the recognized worm powders. *Areca-nut powder is very effective.* One of the best also is oil of male fern mixed with glycerine and powdered gum arabic. Santonin is good especially for round worms, whilst areca nut is particularly suitable for tapeworms. Give a dose of castor oil later, and remember to fast the dog for twelve or more hours before giving the medicine. The longer the fast the better will be the result. Worms are obtained from other dogs, from eating sheep's heads containing cysts (tapeworms), and also from fleas, which are said to carry the cyst from one canine host to another. The isolation of wormy dogs till free from the pest, the thorough cooking of sheep's heads, and the keeping of dogs free from fleas will do much to prevent worms.

Wounds, Bites, &c.

All the dog owner can do is to wash the injured place carefully with a disinfectant and keep it absolutely clean. Should the skin be broken, a stitch or two can easily be inserted. The needle should be a curved one, if possible, and the thread silk or fine gut. Care must be taken not to tear the threads through the skin. The pressure should be equal all along the edge. Remember that hands, implements, needle and thread must be scrupulously clean. It is far better to leave a wound alone than to contaminate it. A dressing of clean lint will keep the place free from dirt.

To stop bleeding there are various means. Tie a bandage on the heart side of the wound, if the blood is bright, and on the opposite side if the blood is dark. A handkerchief or rag stuffed into a deep wound will often arrest bleeding. The writer, after a motor cycle and various other accidents, always uses pepper to stop bleeding, and has found it satisfactory. However, although the pain is nothing to complain of, yet it has been considered cruelty in the eyes of the law to use it on the lower animals.

During June, July, August, and September a dog's feet (particularly in sandy districts) should be carefully examined, for the seeds of the wild barley grass and other things may sometimes force their way into the flesh between the toes and set up severe inflammation and festering wounds unless seen in time. After even a morning's wild-fowling the writer has often found the spaces between the dog's toes full of these things, which, unless removed, may cause severe lameness and swelling.

To keep a dog in health and condition, the most important rules are to feed judiciously and regularly, to keep it clean in a dry loose box or kennel, to avoid pampering, and last, but not least, to look out for the first signs of disease. In case of ill health, it is practically always safe to give a purgative, such as castor oil, and in very many cases of common minor ailments no further treatment will be found necessary.

CHAPTER IV

FERRETS AND THEIR MANAGEMENT

By EDWARD C. ASH, M.R.A.C.

At some stage in his development primitive man realized the value of co-operating with certain of the lower animals. He domesticated the dog, the ox, the cat, and the horse, and perhaps it was at the same time that the first member of the stoat and marten family was used to bolt rabbits. But this is mere conjecture, and all we know is that ferrets of a sort were used in Roman times. We have nothing to tell us whether the Latins were the first to domesticate the Mustelidæ, or whether they had found them in use amongst people over whom they had been victorious.

The origin of ferrets, like their history, must remain a secret hidden by time. Some, however, think (though on what ground is far from clear) that the ferret originated in Africa, whilst others, who are possibly nearer the mark, believe the animal to be a variety of the polecat which had been domesticated. Its dentition, its colour, and its habits, are all so similar to those of the polecat, that there is in fact little doubt as to their relationship. And to make the matter even more certain we find that ferrets and the true (wild) polecats will breed together, and that the result of the cross is not infertile.

Ferrets are members of that vastly interesting family, the Carnivora, and are therefore flesh eaters. This family is characterized by its predominance, by the common sense of its members, by their predatory habits, and also by that astonishing and most useful power of easy adaptability to altered circumstances. Hence we are not surprised to find that ferrets will be happy and thrive on a diet which one would expect to be the most unsuitable, for many hundreds of ferrets live on rations composed totally of bread and milk, whilst many again subsist on similar fare with an occasional luxury in the form of a small bird, a piece of rabbit or some other

flesh, and there are yet very many that live on a basis of flesh diet, and some that live on flesh entirely. But whatever their food may consist of, whether it be rabbits or rats, or bread and milk, the predominant feature of their character, namely their savage hatred for all fur and feather, remains unabated.

Modern man has to thank his primitive ancestors for a most valuable heirloom in the form of the ferret, but unfortunately, up to the present, he has made very little use of the opportunities that have been handed down to him. He has to deal with an animal of the highest order of intelligence, able to learn anything within reason, if only care and thought, coupled with patience, are bestowed on it. He has also several other varieties of the same order—stoats, weasels, martens—now no longer required by man, indeed to-day with a price on their heads, and possibly before he realizes their value, and has time to domesticate them, they will be a thing of the past.

VARIETIES OF FERRETS

There are two varieties of ferrets, the polecat and the white, the latter being an albino, as is proved by its peculiar pink eyes. In general appearance the two varieties are similar—lithe, muscular, long-bodied and short-legged creatures, with well-shaped, intelligent heads, and long, sharp muzzles. The polecat variety is usually the larger, although amongst these very many small specimens are met with. It is somewhat wilder, more agile, and hardier than the white, and is therefore preferred for ratting, where savageness and agility are of particular value. Its colour, however, is very much against it, for it is very similar in shade to a rabbit, and when it emerges covered with sand, many a well-trained terrier has made a mistake, and the life of the ferret has paid the penalty. So the white, although slower and less keen, has the advantage of being more easily recognized.

One cannot picture any animal so relentless, so filled with dogged perseverance, bloodthirstiness, and sheer love of slaughter as the Mustelidæ, of which order the ferret is the most important member. Hour after hour they will follow through the most complicated labyrinths their unfortunate victims, which eventually must seek safety in leaving the earth, or else lie to be scratched and worried to death by these small but ever-persistent pursuers. On the whole, the ferret is in no particular hurry; it will stop at

intervals to peer down unexplored passages or to listen to a fresh sound, and having made up its mind as to the right direction, off it will go once more.

The behaviour of the ferret at work depends greatly on its individuality. Some, particularly of the polecat variety, are always in a hurry, and are altogether indefatigable. Others again are equally cautious, and seem to ponder at every possible opportunity, thus wasting time. These dreamy ferrets are often very annoying to work with, for there is nothing so irritating to the nerves of the ordinary man as the sight of a ferret which, after having vanished for some half an hour or more, reappears to make idiotic grimaces at the edge of the hole.

Should a ferret meet another of its own kind, or a stoat on the same business, they pass each other with an air of armed neutrality. Very seldom if ever will a ferret and a stoat fight, unless actually forced by cramped surroundings to face each other.

ACCOMMODATION FOR FERRETS

Ferrets are naturally hardy animals, but if kept, as they so often are, under most unsatisfactory conditions, not only are they liable to all the ills that may come their way, but at the same time they are no longer sharp and active. In fact, an unhealthy ferret loses all its enthusiasm, and takes little interest in rabbits or anything else, unless actually starving; then it is out to kill, and having accomplished its object, it curls up on the body of its victim unheeding the calls of its owner or the passing of time. And there are very many of these unhealthy ones, for the poor beasts are kept under all sorts of conditions, in small boxes, or beer barrels, seldom cleaned and badly fed. Others again have the fortune to enjoy roomy premises, ferret courts, large hutches, or converted corn chests, where they are kept clean and fed as ferrets ought to be fed. These, the lucky ones, are able to enjoy the day's ferreting perhaps on some occasions as much as, if not more than, their master.

In many cases the accommodation allotted to the ferrets leaves much to be desired; they are often kept in poor, small, insufficiently ventilated hutches, frequently foully dirty in addition. One can hardly imagine a more nauseating sight than such a hutch during the hot summer weather. A suitable ferret hutch should be divided into two compartments, one for sleeping, the other the

•

day room. The partition between the two should have a sliding door, so arranged as to prevent the tenants from opening it at their leisure. For if there is a way, they certainly have the will, and by hook or crook will accomplish it somehow. The hutch need not be an expensive one; many a cheap sugar box has been converted into a most enviable hutch, whilst often an expensive and badly arranged article is highly unsuitable for the purpose.

The living or day room should be fronted with strong $\frac{1}{4}$ -in.-mesh wire; the sleeping compartment can be similar, or else boarded up to a height of 2 in. or so from the top. The floor of the living room should have holes bored in it to allow waste liquids to drain off, or else the wooden floor may be partly replaced with perforated zinc of a fine mesh.

The sleeping compartment must not be cold or draughty: 2 ft. broad by 20 in. long and 18 in. high is all that is desired. The living room should be larger, 30 in. to 36 in. long by 2 ft. broad. The partition between the two rooms should have a sliding door large enough, when open, to allow a ferret to pass through easily. This must be so arranged that it can be opened or closed from the outside of the cage, and also so that it cannot be opened by the inmates at their own sweet will. A method to be strongly recommended is to allow the door to run in grooves. A long wire or wooden handle passes through a hole at the side of the box. The handle should have a projection so that it can be drawn through the hole, and fixed when desired so as to prevent any movement. It is hardly necessary to add that the roof should be sloping, and should project to act as a shade. A hutch of these dimensions is large enough for five or six ferrets.

But the ideal home for ferrets is the court system, which is practically a miniature stockyard and boxes. The floor, which is best made of concrete, should be slightly sloping; the sides, in the lower end of which well-covered perforated zinc pipes must be arranged, should be built to make it impossible for the ferrets to obtain a footing, for there are few creatures so destructive and so ready to return to a wild state, as the domesticated Mustelidæ. At the top end of the court, a set of sleeping boxes should be arranged, each one being wire-fronted and having a sliding door. It is not difficult to imagine the value of this arrangement, for each doe can be let out to feed and exercise and be refastened up before the next one is given similar privileges.

The court should, if possible, be sheltered, but if this cannot be

arranged, at least the sleeping boxes must be protected from the elements. A temporary adjustable partition can be utilized, after the breeding season, for keeping the jills and hobs separate.

If a small heap of sand containing ferret excrements is placed in one of the lower corners, the inmates of the court will be found always to use that particular spot. Fresh sand, cinders, or saw-dust, is used to cover up the excrements. Once or twice a week the court may be washed down and disinfected.

Any enthusiast, who really takes the welfare of his ferrets to heart, may devise courts or hutches to suit his ideas. And he must bear in mind, apart from what has already been mentioned, that warmth is an important factor, and that comfort must not be forgotten. The sleeping compartments of either hutch or court should be furnished with plenty of clean hay or oat straw, changed frequently.

FEEDING

There is no more trouble in feeding regularly or judiciously than in feeding whenever memory prompts, and one cannot expect ferrets, any more than other animals, to do well unless properly cared for.

Ferrets will thrive on a bread-and-milk diet with flesh occasionally, but they are found to do better when flesh predominates; in fact, many breeders believe that their ferrets are healthier, livelier, and more muscular when kept entirely on flesh and water. They should never be given the remains of rabbits, rats, poultry, &c., which have died from natural causes, as to do so is only asking for trouble, and they should always be given their food under cleanly conditions; the dishes used for their bread and milk should be carefully washed out before use.

To prepare bread and milk, use stale bread, pour over it boiling water, and compress the bread to expel as much water as possible, then pour over the bread fresh or skim milk. Mix up well, and add more scalded bread if the food is too liquid.

Meals should be given at regular times; give sufficient, but do not overfeed. When feeding, close the door of the sleeping compartment to prevent the ferrets carrying their food there, and should the hutch be without partition, it is advisable, particularly during hot weather, to fasten a string securely on to the rabbit or other flesh given, or else it may be hidden in the bedding to decay and be a home for maggots.

BREEDING

The jill comes into season twice or sometimes three times in the year. The first period is in April, and she should be left until the swelling is at a maximum. The hob, chosen for his working capabilities as well as from his general appearance, is introduced to the jill on two occasions, alternate days.

The writer has found it unwise to allow a hob to serve more than two or three does at one season. The period of gestation is six weeks, and during this time the in-young jills require to be well fed. They can, however, be used for ratting; in fact, it would seem advisable that this should be allowed. When nearing five weeks, each doe should be placed in her breeding box, and be given plenty of nice clean hay or oat straw. This she will arrange for herself into a convenient bed. If the jills are not separated from each other before having their young, usually a fight takes place, and the rival mothers may destroy each other's progeny.

The litter consists of five or six, and the youngsters are born blind, in fact they only open their eyes a month after birth. The amateur breeder should be wary and stay his curiosity, for jills are not at all over good-natured, as far as their feelings towards mankind are concerned. Indeed, unless one intimately knows the doe, it is advisable to leave the young ones undisturbed until they are six weeks old.

The doe should be well fed twice a day, with bread and milk *in the morning and a piece of rabbit in the evening, and during the day a bowl of milk should stand in her box.* When the youngsters are some four to six weeks old, they will begin to feed with their mother, and they should now be fed three or four times a day, chiefly with bread and milk, for if this is not done, some of them will soon become weak, and be destroyed and eaten by their ever-voracious brothers and sisters.

When they are ten or eleven weeks old (the exact age depending on how strong and healthy they seem), they can be weaned and placed in a hutch by themselves. It is now a time when they are liable to all the various ills of ferret life, such as "Distemper" or "Sweating ill", but if they are well fed and looked after, kept clean and warm, and allowed plenty of fresh air and exercise, it is more than likely that they will escape these diseases. Mismanagement or misfeeding lays them particularly open to them.

Towards the end of June, the jills usually come in season again,

and will breed a second litter in the beginning of August. Jills and hobs, if not allowed to breed, very often die prematurely.

In breeding it is wise to remember—

1. To breed from good stock only.
2. Not to allow the hob too many jills.
3. To feed the doe well during gestation.
4. To separate her from the other jills during the middle of the fifth week.
5. To feed twice a day, and allow milk or water to be constantly in her box.
6. To feed the youngsters three to five times a day; and
7. To interfere with the doe and her family as little as possible during the first five or six weeks.

TRAINING

Perhaps the most fascinating part of keeping ferrets is their training, but unfortunately little real training is done. Yet the ferret is one of the most intelligent animals in existence—equal possibly to any dog.

Training must start at an early age; in fact, if the doe is not a particularly savage one, even at four to six weeks old. At this time the youngsters should be handled and stroked, and learn that a hand is not a thing to bite, and will do them no harm. At feeding times, they should always be called with the same word, "Puggy—Puggy—Puggy", with much accent both on the "Pug" and the "Gy". "Bun—Bun—Bun" is by no means such a good word to train them to, for it allows of no sharpness of enunciation. It does not take long for the youngsters to recognize that "Pug-gy" means that they are wanted for feeding, and they will come bustling out of their sleeping compartment.

As soon as they are nine or ten weeks old, allow them to get hold of a dead rabbit or rat, shake it just in front of their noses, and when they seize it draw it away from them. They very soon learn that if they do not seize it immediately, they lose it, and it is quite amusing to see a youngster's expression of disgust when, on leaving go, he finds the bunny is out of reach, and the more times he loses his grip the keener he will get.

The writer used to take youngsters ten weeks old for walks, and by calling them, when they were liable to stray, and occasionally allowing them to catch hold of a "decoy" in the shape

of a piece of rabbit, they behaved better than any pup. It was certainly a most astonishing sight to visitors to see a small swarm of ferrets hurrying and scampering along behind their master.

In the meanwhile the young ones, with their mother, should be allowed down a small earth where there is certain to be a rabbit. The young ferrets are sure to have some fun, running all over the ground, dodging into this hole and out of that, playing hide and seek, and engaging in rough-and-tumbles at intervals, but a little persuasion and the presence of their mother will lead them "to go to ground". It is very likely that they will meet a rabbit, and possibly the memory of many a tussle for the flesh of the bunny will inspire fresh efforts, and away will go the rabbit, followed by the little pack. It is remarkable how very soon the young ferrets will settle down to their work in earnest.

Every open hole should be netted, and if a rabbit is captured, it should be killed and placed near to the hole from which it has bolted. It is a very good plan to tie a string to it, so that when the young ferrets appear it can be drawn slowly away from them, which will make the rabbit alive again, from the young ferrets' point of view. Then, of course, the entire family throw themselves on their victim, shaking and pulling like small furies. Young ferrets should not be muzzled when first worked.

Never put a young ferret to meet a rat. Many of the latter are more than a match for any ferret, and sometimes for several.

Train your young ferrets to enjoy rabbiting, and not to do so only in order to obtain food. A really well-bred and well-trained ferret, although it will kill on every possible occasion, will not lie up with a dead rabbit, although it will remain with a living one until the familiar "Pug-gy, Pug-gy" calls it off.

It need hardly be remarked that it is unwise to try to make young ferrets attack rats, for the adults of the latter will certainly, if nothing worse, mutilate the former, and a young ferret will take a long time to forget its punishment even if its pluck is not altogether ruined.

In training ferrets be patient. If a ferret absolutely refuses to go to ground, it is of little use to try to force it, for the nature of the beast is one of persistent determination, and the more you try to force it the more it makes up its mind to go its own way.

WORKING

It is customary to muzzle ferrets before putting them to ground for rabbits. The muzzles employed are various—metal, leather, ring and rod, or home-made wool muzzles. Although the former are the easiest to adjust, yet should the ferret be lost, it is doomed to die of starvation. Up to quite recently it was usual to sew up the lips of the ferret, a cruel and unnecessary operation, which to-day is replaced by coping. The wool, boot-lace, or whatever it may be, although special coping wool is by far the best, should be adjusted as follows: First tie a length securely round the animal's neck; continue the two ends to a spot about the centre of the muzzle, and tie them together with a knot, then pass the two free ends beneath the jaw and tie again. It should not be overtight, but just sufficiently so to prevent the ferret from opening its mouth wide enough to bite. The free ends should now be passed through the neck band and tied to it.

One of the most handy implements to assist in muzzling a ferret is a small button hook, for with it you can so much more easily draw the string through the neck band in completing the muzzle. There are other ways of making the muzzle, but the method described is so easy, once managed, and also so effective, that it seems unnecessary to describe others. Ferrets should never be muzzled when ratting.

LINING A FERRET

Ferrets are very often worked on a line, particularly in districts where they bolt badly, and when the intention is not to shoot but to net the rabbits. The collar and line can be obtained from any firm dealing in these commodities. The line ferret which is not muzzled drives the rabbit into a corner and frequently kills. The rabbit dig after the line. Some ferrets are trained to hold on to the rabbit and draw it out. When rabbiting, the largest ferret should be used as a line ferret, and it should be held in readiness in case of emergency.

Should a ferret be lost, the line ferret should be let down all likely holes. Sometimes the line ferret will actually pull the lost one out of the hole by the scruff of its neck, but usually the line stops and you may feel a slight vibration at intervals. At first it is

advisable to try to pull both ferrets and rabbit out; but this must be done carefully, and if the ferret seems to be coming quicker than your pulling accounts for, it should be given more line, as no doubt it has let go of the rabbit and is coming out again. It is advisable to tie a knot every three feet, so that by counting the knots you will know the distance the ferret is in. This may save much labour.

When putting a ferret to earth be kind and gentle to it. Allow it to slip out of your hand into the hole, and do not, as is so often done, throw, push, or kick it down, nor throw earth at it. This only makes a ferret wild, savage, and unwilling, and presuming that it does go to ground under a hail of missiles, it is more than likely that it will turn the next corner, curl up and go to sleep, or else it may wander along to reappear eventually at a distant hole.

If a ferret lies up, what is to be done? Firstly, if it is a well-trained ferret, the usual familiar call is sure to fetch it, or a line ferret may be the means of its recovery. Smoking the holes is another method, which, if well done, is exceedingly successful; but it is bad for the ferret, and should only be used as a last resort. The smell of the intestines of a freshly-killed rabbit, staked on the windward side of the earth, very often brings the ferret out.

It is as well to remark here that ferrets should never be carried in a bag. Not only are they liable to catch cold, but they also easily catch diseases in this way, and, moreover, it is by no means a comfortable means of transit for the little animals. Ferret boxes can be bought practically anywhere, and if not, they can easily be made.

HINTS IN WORKING FERRETS

Always give your ferrets a drink before starting the day.

Work a hedge upwind.

Do not put too many ferrets in a small earth, particularly if uncoped.

When a ferret refuses to go, give it some water to drink, and examine it to find the cause.

When rabbiting, always keep perfectly quiet, and do not let your dogs wander near to the holes.

To pick up a ferret do not snatch at it and draw your hand back, but quietly and quickly seize it behind the head.

After working your ferrets for half a day give them, if possible, a drink of milk.

Be careful that the muzzling is not too tight.

If a ferret is shy, i.e. draws its head down as soon as you wish to catch it, attach short pieces of whipcord to its neck.

To learn to handle ferrets use a good thick glove; this will greatly assist your confidence.

DISEASES

Diseases amongst ferrets are largely the result of want of cleanliness, bad feeding, confinement in damp quarters, and of using the most pernicious ferret bag. Only a few of the commoner diseases are dealt with here.

Distemper

The symptoms of this disease are listlessness, thirst, bad appetite, and often a discharge from eyes and nose. The ferret gradually wastes away.

Isolate the patient; remove to a fresh hutch as far away as possible. The hutch should be well ventilated, but warm and dry. Keep the nostrils and eyes free from discharge by using a sponge and tepid water. Give vaseline pills two or three times a day, and milk of sulphur (enough to cover a threepenny piece) on a piece of flesh once per day. The latter should be continued for a week or fortnight as required. Feed on warm milk, babies' foods, soup, beef tea, &c.; keep clean and warm.

Distemper may be transmitted from dogs to ferrets, and vice versa. Hence the importance of keeping ferrets some distance from dogs.

After the disease is over, the hutch should not be used for a year or two, unless it has been scalded with boiling water and washed inside and out with a strong solution of mercuric iodide or carbolic. Every crack must be filled with the disinfectant, and it is a good plan to allow the liquid to soak well into everything. A further scalding a day or so later, followed by another thorough washing with a powerful disinfectant, is advised. Then the hutch should be allowed to dry by being placed open in the sun. Before use it should again be washed out with quicklime.

Foot-rot

The flesh between the toes becomes inflamed; the claws are marked with brown decaying material. Frequently also the end of the tail is similarly affected, and there are brown patches on the body.

Spirits of tar, creosote, nitrate of mercury ointment, and the usual foot-rot lotions and ointments made up by all country chemists may be used.

This disease is due to unclean surroundings and to the feet not being freed from mud, fur, &c., after a day's work. Prevention is better than cure.

Mange, or Scab

A very nasty disease, similar to that affecting dogs. The symptoms are, reddish appearance of the skin, followed by sores and scabs; the ferrets continually scratching and rubbing. There are various cures; usually sulphur ointment is recommended. Zinc lotion is also advised.

This is a contagious disease. The patient should be isolated and the surroundings carefully and well disinfected.

Overgrown Nails

The nails of ferrets, if not worked enough, will often grow out of proportion, and the ends should be carefully cut off with a sharp razor.

Scratching

If ferrets are seen to scratch they should be at once examined for signs of mange or parasites. Possibly the irritation may be due to fleas or ticks; should it be the latter, dress with a mixture of 1 to 8 of paraffin and sweet oil, and disinfect and wash the house.

Worms

The ferrets do badly although well fed. Give a few grains of finely-powdered areca nut in milk twice a day, followed later by a few drops of castor oil. Be careful after freeing the ferrets from these parasites to remove all excrements and to scald out the houses and disinfect carefully.

Wounds

Ferrets if badly bitten by rats should be immediately seen to; the wound should be washed out with a solution of lysol and water, and dressed with vaseline or lard. Wounds should be kept clean, and bathed at intervals of a few days until they show a healthy appearance and start to heal.

In order to keep ferrets in good health and good condition,

Ferrets and their Management 169

thorough disinfection is very important; you cannot do too much of it. Use strong solutions of carbolic, lysol, mercuric iodide, quicklime, and scalding water. Fumigate if necessary with sulphur candles or formalin. Boiling water, sunshine, fresh air, and really powerful disinfectants are the only means of destroying disease germs. It should be remembered that diseases, particularly infectious ones, such as distemper, can be easily carried from affected cases to healthy hutches by one's clothing, boots, hands, &c., and therefore every precaution should be taken by using special gloves to handle infected cases.

CHAPTER V

ASSES AND MULES

BY PROFESSOR JAMES WILSON, M.A., B.Sc.

When we are full of facts about a subject we start theories to explain them; when we are empty of facts we speculate. As to the origin and history of the donkey we can do no more than speculate, for few, if any, facts are known. We are even worse off than Darwin, for some of the facts on which he relied are facts no longer, and the only opening left is that leading to speculation. Yet, tempting as it is, for speculation is always tempting if only for the reason that almost anything can be said without fear of contradiction, we shall do better if we give a glance at the question of equine origin and history as it stands to-day.

Darwin observed that, in his day, most of the wild Equidæ then known—asses, onagers, zebras, and so on—were barred and striped. He also observed frequent ancestral reversions among domestic animals, and, more especially, barred and striped reversions among horses. Thus he connected together the tame with the wild Equidæ, and then projected both kinds back to a common ancestor which was barred and striped. In 1858, in *The Origin of Species*, he writes as follows: "For myself, I venture confidently to look back on thousands and thousands of generations, and I see an animal striped like a zebra, but perhaps otherwise very differently constructed, the common parent of our domestic horse (whether or not it be descended from one or more wild stocks), of the ass, the hemionus, quagga, and zebra". Criticism of this speculation could avail but little, because, for lack of data, no more could be said for it than against. No one could say when and how stripes had originated; no one could say when and how they had not originated. How they may be dropped and how they may be acquired in a domestic breed of horses is now readily understood, for the breeders have merely to cross their breeds with other stock which have them or have them not, as the case may be; but how

Prjvalsky's wild horse, discovered since Darwin's time, succeeded in divesting itself of its stripes, if it ever had them, is another matter altogether.

But Darwin went farther, for in 1868, in *The Variations of Animals and Plants under Domestication*, he added the dun colour to the stripes of the ancestral horse: "The appearance of the stripes on the various breeds of the horse when of a dun colour does not afford nearly such good evidence of their descent from a single primitive stock as in the case of the pigeon. . . . Nevertheless the similarity of the most distinct breeds in their general range of colour, in their dappling, and in the occasional appearance, especially in duns, of leg-stripes, and of double or treble shoulder stripes, taken together, indicate the probability of the descent of all the existing races from a single dun-coloured, more or less striped, primitive stock, to which our horses still occasionally revert."

The chief objection to this theory—we can call it a theory since it is based upon observations about reversion—is that only one colour of horse, the grey, and none of the other Equidæ—asses, zebras, onagers, or even mules—ever reverts to dun. Grey horses throw dun foals, but the other colours, bay, brown, black, and chestnut, never do so. Darwin was apparently misled by Lord Morton's description, published by the Royal Society in 1821, of the two foals out of a chestnut mare he had sold to Sir Gore Ouseley, which, while in Lord Morton's possession, was asserted to have had her first foal to a quagga. The mare was believed to have been so affected by her first service that her later foals to a black—probably a dark-brown—Arabian were striped along the back and barred across the withers. Lord Morton describes the two foals thus: "They have the character of the Arabian breed as decidedly as can be expected, where fifteen-sixteenths of the blood are Arabian; and they are fine specimens of that breed; but both in their colour, and in the hair of their manes, they have a striking resemblance to the quagga. Their colour is bay, marked more or less like the quagga in a darker tint. Both are distinguished by the dark line along the ridge of the back, the dark stripes across the fore-hand, and the dark bars across the back part of the legs. The stripes across the fore-hand of the colt are confined to the withers, and to the part of the neck next to them; these on the filly cover nearly the whole of the neck and the back, as far as the flanks. The colour of her coat on the neck adjoining the mane is pale,



approaching to dun, rendering the stripes there more conspicuous than those on the colt. The same pale tint appears in a less degree on the rump; and in this circumstance of the dun tint also she resembles the quagga." But Darwin intensifies Lord Morton's "approaching to dun" twice. First he writes: "these colts were partially dun-coloured", and then generalizes to the completely dun horse. Perhaps he was also misled by Hamilton Smith, who wrote that "the dun is typical of the generality of all the real wild horses, still extant in Asia, and the semi-domesticated both there and in Eastern Europe". In any case, greys only can throw dun progeny. The only wild horse now known, Prjvalsky's, is not a dun but a bay, if we are to judge by the specimens brought to this country; and Sir Gore Ouseley's colts, if we are to judge them by Agasse's portraits hanging in the rooms of the Royal College of Physicians in London, were a pair of very beautiful bays of the variety sometimes spoken of as mahogany.

It will be safer, therefore, to decline discussing the ass's ancestry and history, and come down to the animal itself. There are several kinds of wild asses, conspicuous among them being the African, with both back and shoulder stripes, the Somaliland, with no shoulder stripe, but with bars from the hoofs to above the hocks, and the Asiatic, which varies in markings and appearance in different countries, and is variously described as the onager (hemione), the kiang, and the hemippus. The domestic ass is like every wild ass in some points, but differs from all in points enough to make him a separate and distinct variety. His colour varies from a French grey which is nearly white, as found in Egypt, through the *common donkey colour as it is found in Britain*, to a very dark brown which is common in Southern France and Spain. His coat varies from the shagginess of a Shetland pony in Poitou to almost the fineness of a thoroughbred in Egypt and Syria. His height varies from thirty inches in India to double that height in Spain and America. He has many good points, among which might be mentioned, great strength for his size, a constitution which keeps him alive and strong upon very indifferent fare and shelter till he is fifty or sixty years old, a large share of the copy-book qualities patience and perseverance, a stolid temperament, and an intelligence which makes the most of things in securing his own comfort and well-being. Against these, however, have to be set points which make an active and enterprising man avoid him as a skilled workman avoids an awkward and unhandy tool. These are his heavy

head carried low because of the short withers—thus giving poor fore-leg action—and his long, weak-joined back, and badly set and shaped and poorly muscled hind legs, giving ineffectively directed action behind. In addition, he is frequently stubborn, and his feet are nearly always badly shaped.

This is perhaps a strong indictment; but it is not against the donkey. Nor is it against his breeder, but rather against his fate. Wherever he goes, the donkey runs up against more successful competitors in the ox and the horse, and so finds himself relegated to the service of the man of small enterprise who may not know that the donkey could be improved or think improvement worth his while. In the United Kingdom donkeys are bred on the smallest farms, usually on such as are too small to employ horse labour. By far the largest number are bred in Ireland. But it must not be assumed that donkey owners take any large say in determining which shall be the parents of next year's foals. That is generally seen to by the donkeys themselves. Living in comparative freedom, and finding its sustenance behind fences and hedges and along the lanes and highways, the donkey has many opportunities of meeting with others of its own kind, and, as a result, donkey foals are usually surprises and of doubtful paternity. Trotting by its mother's side, even when she carts the milk to the creamery or the provisions from the store, the foal learns the casual ways of donkeys and is very soon able to fend for itself. When it is a two-year-old it may take its mother's place in the donkey cart, or, if not required for this, it may find itself far away, the plaything of a richer man's children or the slave of some costermonger or other small vendor. It needs but little training and usually gets less. Consequently it does not always know what to do, and so gets credit for perverseness beyond its deserts.

Thus, as ordinary donkeys are seldom worth more than a pound or two, the inducements towards improvement are not great, and the conditions under which they live are not very favourable. The donkey is a striking example of Darwin's dictum that improvement is unlikely unless the stock to be improved are kept in large herds and flocks. Yet that the donkey could be improved there is no doubt whatever, for there are some with lighter heads and higher withers, some with firmer loins, some with better legs, and some with better feet than the average; and if such were retained and bred from, the first steps on the road towards improvement would have been taken. This, however, needs organization: co-

breed strong draught mules, for which they get 20 to 30 per cent more than they would for their horses, the Poitou farmers wish a strong jackass to mate with their mares, and with this the ass breeders of Melle and Chef-Boutonne provide them. The asses are not so large as some Spanish asses, of which the late Mr. Harold Sessions had one standing 15 hands at four years old; but they have better and stronger legs, and, for an ass, unusually good well-spreading feet. A good jackass may be worth £100 or even more, and thus there is sound temptation to keep the stock up to standard. In the mule-breeding districts the jackasses stand at the *ateliers* or "stables" of their owners, who are generally at the same time owners of cart stallions, and there the mares of the countryside are sent to produce mules with the jackass or to keep up the cart-horse supply with the cart stallion.

The example of Poitou is wonderfully instructive. The improvement of the donkey depends upon the demand for the mule, the donkey to be bred upon the kind of mule to be bred, and both donkey and horse must be such as will combine to produce the animal desired. If we wish draught mules, then we must have strong donkeys and heavy cart mares; if we wish mules of a more active kind for army wagons, then we must have lighter and more active donkeys and lighter cart mares; and if we wish still speedier mules for riding or light draught, then we must have still lighter-legged donkeys and mares of the thoroughbred type.

Index

A

- Aberdeen, Countess of, breeder of goats, vi, 65.
- Aberdeen-Angus cattle, i, 31-42; principal breeders, i, 33-8; beef qualities, i, 39, 242, 249; weights, i, 39; calves, i, 39-40; exports, i, 40-1; selling centres, i, 41; prices, i, 41; crossings, i, 41-2; as milkers, i, 42; aggregate number, i, 57.
- Aberdeen Champion*, Clydesdale, iii, 2.
- Abortion, in cattle, ii, 193-5; in sheep, iv, 234-5; in pigs, v, 125-6.
- Abscesses, in cattle, ii, 219-20, 242; in dogs, vi, 148.
- Acquired characters, inheritance of, i, 9; modifications in cases of mutilations, i, 10; in cases of disease, i, 10; in cases of use and disuse of special parts, i, 11-2; theory of Lamarck, i, 11; theory of Darwin, i, 11.
- Actinomycosis of the udder, in pigs, v, 130.
- Acton Comet*, Red Poll bull, i, 128.
- Acton Dairymaid*, Red Poll cow, i, 128.
- Acton Fillbail*, Red Poll cow, i, 128.
- Acton Reynold herd of Red Polls, i, 132.
- Adeane, C. R. W., breeder of South-downs, iv, 79.
- Adeney, George, breeder of Shropshires, iv, 74.
- Administration of medicine to cattle, ii, 263.
- Advanced Registry, for Guernsey cattle, i, 73-5.
- Advisory Councils, for the improvement of cattle, i, 218.
- Aggregate output of British breeds of cattle, i, 57.
- Agnew's Farmer*, Clydesdale, iii, 4.
- Agricultural survey of English counties, i, 124.
- Air in the chest, in cattle, ii, 241-2.
- Aitchison, Mr., of Linhope, breeder of Cheviots, iv, 28.
- Albuminoid ratio of feeding-stuffs, ii, 85-7, 138.
- Albuminoids, ii, 69, 78.
- Alcama*, Lincoln Red cow, i, 116.
- Allender, G. Mander, breeder of pigs, v, 5, 26, 28.
- Alvord, Henry E., dairy division, U.S.A., ii, 33.
- Amaurosis, in cattle, ii, 212; in dogs, vi, 148.
- American Bronze turkey, v, 174.
- American cheese, ii, 106.
- American Guernsey Cattle Club, i, 73.
- American Hereford Record, i, 79.
- American Red Poll Society, i, 127.
- American trotting horse, i, 27, 202.
- Amides, ii, 69, 79.
- Anæmia, in cattle, ii, 174-5; in dogs, vi, 148-9.
- Ancon or "Otter" breed of sheep, i, 6-7.
- Ancona fowl, v, 138-9.
- Andalusian fowl, v, 139.
- Anderson, Robert, of Drumore, breeder of Clydesdales, iii, 3.
- Angora rabbit, i, 14.
- Angus*, Aberdeen-Angus bull, i, 36.
- Anthrax, in cattle, ii, 165; symptomatic, quarter ill or blackleg, in cattle, ii, 165-8; in sheep, iv, 210-2; in pigs, v, 104.
- Antrim, Earl of, breeder of Galloways, i, 67.
- Anus prolapsed, in dogs, vi, 149.

- Aphtha, in sheep, iv, 214-6; in poultry, v, 261.
- Apoplexy, in cattle, ii, 215; heat in cattle, ii, 217; of the lungs in cattle, ii, 242; in pigs, v, 114-5; in dogs, vi, 149.
- Approved cattle-breeding societies in Scotland, i, 220-1.
- Armstrong College, ii, 108, 114.
- Arnold, Messrs., of Smithfield, surgical-instrument makers, ii, 245.
- Arthur D.*, Polo pony, iii, 74.
- Asses, vi, 171-5; ancestry and history, vi, 171-3; wild (African, Somaliland, and Asiatic), vi, 173; domestic, vi, 173-4.
- Asthenia, or going light, in poultry, v, 264-5.
- Asthma, in cattle, ii, 242; in dogs, vi, 149.
- Atholl, Duke George of, breeder of Highland cattle, i, 88.
- Atholl, Duke of, breeder of Highland ponies, iii, 68.
- Atholl fold of Highlanders, i, 87-8.
- Auction marts for cattle, ii, 14-5.
- Aurta*, Shire mare, iii, 15.
- Axe, Professor, writer on swine, v, 113, 118.
- Aylesbury duck, v, 166-7.
- Aylmer, Hugh, breeder of Shorthorns, i, 161.
- Ayrshire cattle, i, 42-51; general description, i, 42-3; origin, i, 43-4; exports, i, 45; hardiness and adaptability, i, 45; milking capacity, i, 45-7; defects, i, 47; beef properties, i, 47; calves, i, 48-9; crosses, i, 50; home markets for, i, 50; prices, i, 51; aggregate number, i, 57; loss of milk by horning, i, 201; as cheese makers, i, 228.
- ## B
- Baasay*, Clydesdale, iii, 3.
- Bab at the Boustler*, greyhound, vi, 115.
- Bacon-curing, v, 75-99; history, 75-8; statistics, v, 78; the bacon-curer's pig, v, 79-80; bacon-curing on the farm, v, 80-90; co-operative bacon-curing, v, 90; bacon-curing in the factory, v, 90-5; curing of hams, v, 95-6; American process of ham-curing, v, 96-9; drying and other departments of the factory, v, 99.
- Bakewell, Robert, of Dishley, greatest of breeders, i, 194-5, 26, 121, 196, 199, 242; ii, 3, 45, 56; iv, 2, 21, 30, 56-7, 68, 139.
- Ballindalloch breed of cattle*, i, 37-9.
- Banks, Sir Joseph, breeder of Ryeland sheep, iv, 72.
- Bannister, T. & Co., Hayward Heath, Sussex, i, 181.
- Banostine Belle de Kol*, Holstein-Friesian cow, i, 52.
- Bapton Manor herd of Shorthorns, i, 147.
- Barber, J. H., Arnside, Carnforth, breeder of Limestone sheep, iv, 58.
- Barber's Proctor*, Suffolk horse, iii, 22.
- Barclay, Mr., of Urie, breeder of Clydesdales, iii, 5.
- Barker, Sir John, breeder of Polo ponies, iii, 75.
- Barneby, W. T., of Saltmarshes, i, 83.
- Baron of Buchlyvie*, Clydesdale, iii, 10.
- Baron's Pride*, Clydesdale, i, 23; iii, 10.
- Barr's Prince Royal*, Clydesdale, iii, 3.
- Barton, H. D. M., the Bush, Antrim, breeder of Blackface sheep, iv, 19.
- Barton, Mr., of Straffan, Kildare, breeder of Shorthorns, i, 162.
- Bates, Thomas, of Kirklevington, breeder of Shorthorns, i, 91, 115, 142-3, 166-7, 197, 205; ii, 27.
- Baumber, Mr., of Somersby, breeder of Lincoln Reds, i, 115.
- Bawdsey Jewel*, Suffolk mare, iii, 93.
- Beagles, vi, 107.
- Beale-Brown, Mr., Andover Ford, Glos., iv, 116.
- Beau Sabreur*, Shorthorn bull, i, 166.
- Beauty*, Shetland pony, iii, 79.
- Bedding of cattle, ii, 260-1.
- Bedford, Duke of, breeder of Herefords, i, 79.
- Beef cattle, i, 241-54; selection, 243-51; characteristics, i, 251; judging, i, 252-3.
- Beehill, Baron, introducer of Pointers, vi, 119.
- Bee Pét*, vi, 49-55.
- Bees, and their management, vi, 1-63; situation and surroundings, vi, 1-5; appliances and cost, vi, 5-11; marketing

- comb honey, vi, 11-5; marketing extracted honey, vi, 15-9; constituents of the bee community, vi, 19-21; workers, vi, 21; drones, vi, 21-2; anatomy of bees, vi, 22-6; life-history, vi, 26-8; swarms, vi, 28-31; the hive, vi, 31-7; manipulation, vi, 37-42; feeding, vi, 42-43; recipe for making candy, vi, 43; winter management, vi, 44; honey, vi, 44; propolis, pollen, and beeswax, vi, 45; diseases, vi, 45-58; enemies of bees—ants, birds, lice, &c., vi, 58-63.
- Biddell, Mr., breeder of Red Polls, i, 127.
- Biddell, Mr. Herman, historian of the Suffolk horse, iii, 20-1.
- Biggar, Thos., and Sons, breeders of Galloways, i, 67.
- Biliousness, in dogs, vi, 149.
- Blackface Lustre sheep, iv, 19-21.
- Blackface sheep, iv, 15-9.
- Black Greys breed of cattle, i, 245.
- Blackhead, in poultry, v, 265.
- Black Leg, in cattle, ii, 165-8.
- Black Prince of Tillyfour*, Aberdeen-Angus bull, i, 38.
- Blackwell Ox, The, ii, 4.
- Blain, in dogs, vi, 149.
- Blake's Farmer*, Lincolnshire trotting stallion, iii, 22.
- Blast, in cattle, ii, 178.
- Blase*, Clydesdale, iii, 2.
- Bleeding, or flooding, in cattle, ii, 199.
- Bleeding from the lungs, in cattle, ii, 242-3.
- Bleeding of cattle, ii, 263.
- Blowwhirl, in sheep, iv, 186-90.
- Blotfield, Mr. Herbert, Red Poll expert, i, 127.
- Blood-sucking flies, in horses, iii, 221.
- Bloody milk, in cattle, ii, 204.
- Blotch, in dogs, vi, 149.
- Blown, in cattle, ii, 178; in sheep, iv, 249.
- Blue and ropy milk, in cattle, ii, 204.
- Blue Greys breed of cattle, i, 67-8, 244-5; ii, 7, 9, 23, 90.
- Blyth*, Clydesdale, iii, 4, 8.
- Booth, Messrs., of Warlaby and Killisby, breeders of Shorthorns, i, 142, 167, 197; ii, 46.
- Border Leicester sheep, iv, 21-5.
- Bourke, Mr., of Pretoria, breeder of South Devons, i, 170, 174.
- Bowie, Mr., Mains of Kelly, breeder of Aberdeen-Angus, i, 35-6.
- Bownass, Richard, Kirkby Lonsdale, breeder of Rough sheep, iv, 71.
- Braay's Briton*, Suffolk horse, iii, 22-3.
- Brahma fowl, v, 147-8.
- Brandon Grenadier*, Lincoln Red bull, i, 119.
- Brandt, A. P., breeder of Lincoln Reds, i, 117, 119.
- Braxy, disease of sheep, iv, 206-10.
- Breadalbane, Marquis of, breeder of Highland cattle, i, 88.
- Breeding, principles of, i, 1-30; germ plasm theory, i, 4-7; mutations, i, 7-8; acquired characters, i, 9-12; telegony, i, 12-3; Mendelism, i, 14-20; inbreeding and line breeding, i, 20-4; aims of the breeder, i, 24-6; selection, i, 26-8; compensative mating, i, 28; pedigrees, i, 28-30.
- Breeding from a record performance, i, 201-2.
- Breeding troubles in pigs, v, 125.
- Bright, Mr., of Ivington, i, 83.
- British Dairy Farmers' Association, i, 159.
- Britisher*, Hereford bull, i, 83.
- Broadbent, Sir Wm., pronouncement on goats' milk, vi, 92.
- Brockbank, A. H. Fox, breeder of Galloways, i, 67.
- Brocket-faced Galloways*, i, 67.
- Broken bones, in cattle, ii, 251-2.
- Broken knee, in horses, iii, 212-3.
- Bronchitis, in cattle, ii, 237-8; verminous, in cattle, ii, 243-6; parasitic, in sheep, iv, 179-83; in poultry, v, 257; verminous, or gapes, in poultry, v, 258-9; in dogs, vi, 150.
- Broomfield Champion*, Clydesdale, iii, 2, 4-5.
- Brown, David, of Stepford, breeder of Galloways, i, 67.
- Brown, James, of Knockbrex, breeder of belted Galloways, i, 67.
- Brown, Professor, of Ontario, i, 40.

- Broxbourne Topsy*, goat, vi, 100.
 Bruce, James, of Inverquhomery, cattle breeder, i, 91.
 Bruce, Robert, Agricultural Superintendent, Koyal Dublin Society, i, 111.
 Bruised sole, in horses, iii, 248.
 Brushing, cutting, or interfering, in horses, iii, 251.
 Bryan, Mr., breeder of Oxford Downs, iv, 64.
 Bryden, James, breeder of Cheviots, iv, 26, 28.
 Brydon, Robert, breeder of Shetland ponies, iii, 78-9.
 Buccleuch, Duke of, breeder of Galloways, i, 63, 67.
 Buff Rock fowl, v, 156.
 Bull Clubs, i, 206-13.
 Bulldogs, vi, 108-9.
 Bumblefoot, in poultry, v, 267.
 Bumped knee, in horses, iii, 211-2.
 Burdett-Coutts, Baroness, breeder of goats, vi, 65, 67, 100.
 Burns and scalds, in cattle, ii, 232-3.
 Burnt sole, in horses, iii, 251.
Burton Excellence, Lincoln Red bull, i, 118.
 Burton herd of Lincoln Reds, i, 117-8.
Burton Quality III, Lincoln Red cow, i, 118.
Burton Quality V, Lincoln Red cow, i, 118.
Buscot Harold, Shire horse, iii, 15.

C

- Caked bag, in cattle, ii, 205-7.
 Caldwell, Mr., of Ballymena, breeder of Galloways, i, 67.
 Cambridge Bronze turkey, v, 174-5.
Cambridge V, Lord Exeter's bull, i, 116.
 Cameron, Mr., of Gesto, Skye, breeder of Cheviots, iv, 29.
 Campbell, Colio, of Jura, breeder of Highland cattle, i, 88.
 Campbell, Mrs., of Uley, breeder of poultry, v, 167.
 Campbell duck, v, 167.

- Camperdown, Earl of, breeder of Highland cattle, i, 91.
 Campine fowl, v, 140.
 Canadian goose, v, 172-3.
 Cancer, in cattle, ii, 221.
 Canker of the ear, in dogs, vi, 150.
 Canulas, ii, 178.
Cape Flyaway, Hunter, iii, 47.
 Capped elbow, in horses, iii, 214-5.
 Capped hock, in horses, iii, 215-6.
Captain of the Guard, Shorthorn bull, i, 147.
 Carlingsford, Lord, breeder of Shorthorns, i, 147.
 Carr, William Broughton, designer of beehive, vi, 5, 32.
 Cartwright, E. H., of Keddington, breeder of Lincoln Reds, i, 117.
 Cartwright, Mr., of Tathwell, breeder of Lincoln Reds, i, 115.
 Castration, of calves, ii, 254-8; in female calves, ii, 258-9; of sheep, iv, 244-5; of pigs, v, 131-3.
 Cataract, in cattle, ii, 211-2; in horses, iii, 197-8.
 Catarrh, in cattle, ii, 234; malignant, ii, 234-5; in horses, iii, 201-2; in poultry, v, 254; infectious, or roup, in poultry, v, 255-7.
 Cattle, British breeds of, i, 31-100.
 Cattle, crosses of: Ayrshire, i, 50; Holstein, i, 55; Devon, i, 59; Galloway, i, 67; Guernsey, i, 72-3; Hereford, i, 83; Highland, i, 90-1; Jersey, i, 99-100; Dexter, i, 108-9, 245; Shetland, i, 137; Shorthorn-Aberdeen-Angus cross, i, 158; South Devon, i, 174; Welsh Blacks, i, 188-9; Jersey-Angus cross, ii, 23-4.
 Cattle, diseases of, ii, 161-263; infectious or contagious, ii, 161-71; dietetic and constitutional, ii, 171-5; of the digestive organs, ii, 175-87; of the liver, ii, 187-90; of the urinary organs, ii, 190-2; of the breeding organs, ii, 193-209; of the eye, ii, 209-12; of the nervous system, ii, 212-8; of the skin, ii, 218-22; parasitic diseases of the skin, ii, 222-33; of the breathing organs, ii, 233-46; of the heart, ii, 246-7; of the bones and

- feet, ii, 247-54; castration, ii, 254-9; sanitation, ii, 259-63.
- Cattle, feeding of, ii, 65-160; general principles of animal nutrition, ii, 65-90; rearing and feeding of young cattle, ii, 90-105; feeding of dairy cows, ii, 105-26; fattening cattle in summer and winter, ii, 126-60.
- Cattle, general management of, ii, 1-63; varieties of cattle, ii, 5-8; supply of cattle, ii, 8-10; attention to cattle, ii, 10-12; good management, ii, 12-3; selection, ii, 13-4; buying and selling, ii, 14-5; systems in different districts, ii, 15; cattle and tillage land, ii, 15-6; housing, ii, 16; healthy cattle, ii, 17-20; continuous progress in cattle, ii, 20; rate of progress, ii, 20-2; importance of breeding, ii, 22-4; calving, ii, 24-6; the dairy herd, ii, 26-30; breeding for milk, ii, 30; milk recording, ii, 30-1; local authorities and the dairy farmer, ii, 31-4; conditions of successful dairying, ii, 35-43; pedigree stock breeding, ii, 43-7; starting a herd, ii, 47-8; the females, ii, 48-51; the sire, ii, 51-4; the coat, ii, 54-6; inbreeding, ii, 56-7; fashionable pedigrees, ii, 57; constitution, ii, 57-9; the growing herd, ii, 59-63.
- Cattle, improvement of, i, 191-222; early English improvers, i, 191-4; Robert Bakewell, i, 194-5; Robert and Charles Colling and other improvers, i, 195-8; methods of improvers, i, 198-9; opportunities for improvement in quantity of beef and milk, quality of milk, environment, and absence of horns, i, 199-203; by co-operation, i, 203-5; by Cattle Shows, i, 205-6; by Bull Clubs, i, 206-13; by Departments of Agriculture, i, 213-22.
- Cattle, selection and judging of, i, 223-54; dairy cattle, i, 223-41; beef cattle, i, 241-54.
- Cattle, summer and winter fattening, ii, 126-60; early maturity, i, 127-9; selection, ii, 129; summer fattening, ii, 129-30; pastures, ii, 130-2; concentrated food on pasture, ii, 132-3; returns, ii, 133-4; winter fattening, ii, 134-59 accommodation, ii, 135-7; foods to be used, ii, 137-40; mixed foods, ii, 140-2; general management, ii, 142-3; roots, ii, 143-5; potatoes, ii, 145-6; hay and straw, ii, 146-7; grain, ii, 147-8; purchased foods, ii, 148-53; rations, ii, 153-6; fattening for the Christmas market, ii, 156; quantity of concentrated food supplied, ii, 156-8; cost of feeding, ii, 158-60.
- Cattle, young, rearing and feeding of, ii, 90-105; milk selling and the supply of calves, ii, 90-1; guiding principles, ii, 91; the calf-house, ii, 92-3; the newborn calf, ii, 93-5; cream substitutes, ii, 95-6; after first month, ii, 96-8; dietary table, ii, 98-9; calf-rearing on cheese-making and milk-selling farms, ii, 99; milk substitutes, ii, 100-1; the second half-year, ii, 101-2; feeding for "baby" beef, ii, 102-3; grazing of calves, ii, 103; wintering of yearlings, ii, 103-4; second grazing season, ii, 104; winter feeding of two-year-old bullocks, ii, 104-5; breeding heifers, ii, 105.
- Cecil, Lord Arthur, authority on ponies, iii, 59, 64-5, 69-70, 71, 74.
- Celtic cow, i, 31-2.
- Ca. Beaufort, mastiff, vi, 116.
- Ca. Minting, mastiff, vi, 116.
- Champion of England, progenitor of Scotch Shorthorns, Shorthorn bull, i, 144, 198.
- Champion's Goalkeeper, Shire stallion, iii, 19.
- Chatsworth strain of mastiffs, vi, 116.
- Chatterton, Messrs., breeders of Lincoln Reds, i, 116-9.
- Cheape, Mr., of Mull, breeder of Highland ponies, iii, 68.
- Cheviot sheep, iv, 25-9.
- Chiddingstone Malcolm, Sir R. P. Cooper's Shorthorn bull, i, 119.
- Chilled brood, in bees, vi, 47.
- Chinese or Knobbed goose, v, 173.
- Chirnside, A. S., of Victoria, breeder of South Devons, i, 170.
- Clarissa, Red Poll cow, i, 831.
- Clark, James, of Auchenhay, breeder of Galloways, i, 67.

- Clark, W. J., Sec. Soc. of Derbyshire
Gritstone sheep, iv, 35.
- Cleaving drench, for pigs, v, 128.
- Cleveland, Duke of, iii, 31.
- Cleveland Bay and Yorkshire Coach horses,
iii, 29-37.
- Clicking, in horses, iii, 252-3.
- Cliff, Walter, breeder of Harness ponies,
iii, 65.
- Clouds and specks on the eye, in cattle,
ii, 210.
- Clyde*, alias *Glancer*, Clydesdale, iii, 3.
- Clyde*, alias *Prince of Wales*, Clydesdale,
iii, 3.
- Clydesdale horses, iii, 1-11.
- Clydeside*, Clydesdale sire, iii, 4.
- Coate, Mr., breeder of pigs, v, 25.
- Coccidiosis or blackhead, in poultry, v,
265.
- Cochin China fowl, v, 149.
- Cockle Park, experimental farm, ii, 151.
- Cocks, R. E., breeder of South Devons,
i, 172.
- Coke, Mr., of Holkam, originator of Red
Polls, i, 197.
- Colantha II Johanna*, Holstein-Friesian
cow, i, 52.
- Cold, common, in cattle, ii, 234; in horses,
iii, 201-2; in poultry, v, 254.
- Coleridge Hero*, South Devon bull, i, 172.
- Colic, in cattle, ii, 182; in dogs, vi, 150.
- Colic, in horses, iii, 206; flatulent, iii,
208-9.
- Collies, vi, 109-10.
- Colling, Charles and Robert, breeders of
Shorthorns, i, 195-7, 114, 121, 140-2,
198-9, 205, 246; ii, 3-4, 27, 43, 45, 48,
56, 60.
- Collynie herd of Shorthorns, i, 147.
- Colostrum or first milk, ii, 93.
- Comet*, Shorthorn bull, i, 22-3, 114, 141-2;
196; ii, 45.
- Comet*, Clydesdale, iii, 5.
- Coming out of the bladder, in cattle, ii, 192.
- Coming out of the bowel, in cattle, ii, 186;
in pigs, v, 211-3.
- Commons Grazing Committees, i, 205, 219.
- Congestion of the lungs, in cattle, ii, 238;
in poultry, v, 259.
- Connemara ponies, iii, 57-8.
- Conqueror*, Clydesdale, iii, 8.
- Constipation, in foals, iii, 243; in pigs,
v, 106-8; in poultry, v, 264; in dogs,
vi, 151.
- Cook, William, of Orpington, breeder of
poultry, v, 151-3, 170.
- Coomassie*, greyhound, vi, 115.
- Copthorne Orange*, goat, vi, 92, 100.
- Corbet, Sir W., breeder of Red Polls, i,
132.
- Corns, in horses, iii, 248-9.
- Cornthwaite, J., breeder of Limestone
sheep, iv, 58.
- Cotswold sheep, iv, 29-32.
- Coulham, Mr., of Withern, breeder of
Lincoln Reds, i, 115-6.
- County Councillor*, Lonk ram, iv, 64.
- Courtney*, Shorthorn bull, i, 147.
- Cowan, T. W., designer of apiary extractor,
vi, 9.
- Cow-pox, ii, 162-3.
- Cowslip III*, goat, vi, 91.
- Cowslip V*, South Devon cow, i, 171.
- Cracked heels and mud fever, in horses,
iii, 216-7.
- Craig-phadrig*, Cheviot ram, iv, 26.
- Crawford, Lady Gertrude, breeder of Shet-
land cattle, i, 135.
- "Cream tribe" of dairy Shorthorns, ii, 27.
- Creve-cœur fowl, v, 165.
- Crimson King*, Lincoln Red bull, i, 119.
- Crisp's Horse*, Suffolk, iii, 21-2, 24.
- Crisp's Conqueror*, Suffolk, iii, 23.
- Crood, Major, breeder of poultry, v, 151.
- Crofton, Mr., of Holywell, early cattle
breeder, ii, 4, 53.
- Cross-bred sheep, iv, 130-3.
- Crossing, W. J., breeder of South Devons,
i, 172.
- Croup, in calves, ii, 236-7.
- Crowther, Professor Charles, ii, 71, 112,
117, 154.
- Crude fibre, ii, 70-1.
- Cruickshank, Amos, of Sittyton, breeder

- of Scotch Shorthorns, i, 144-6, 148, 155, 160, 197-8; ii, 45, 57.
- Culley, Matthew and George, early breeders of Shorthorns and sheep, i, 193, 196, 242; iv, 60, 96, 139; v, 75.
- Cullum, Jerry, early owner of Suffolks, iii, 21.
- Cullum, Sir Thomas, early owner of Suffolks, iii, 21.
- Cundy, T., breeder of South Devons, i, 171.
- Cunningham, John, breeder of Galloways, i, 67.
- Cunningham, R. D. Barré, breeder of Galloways, i, 67.
- Cupbearer*, Suffolk, iii, 23.
- Curby hocks, in horses, iii, 196-7.
- Cutting, in horses, iii, 251.
- D**
- Daer, Lord, breeder of Galloways, i, 62.
- Dainty Davy*, Cleveland Bay, iii, 31.
- Dairy cattle, feeding of, ii, 105-26; summer feeding, ii, 107-8; supplementary foods on grass, ii, 108-9; "soiling" crops, ii, 109-10; cows in autumn, ii, 110-1; incalf heifers, ii, 111-2; rations for cows, ii, 112-21; preparing the food, ii, 121-3; careful feeding, ii, 123; cost of feeding, ii, 123-4; effect of food on milk, ii, 124-5.
- Dairy cattle, selection and judging of, i, 223-42; characteristics, i, 228-31; judging, i, 231-5; milk records, i, 235-42.
- Dale, T. F., breeder of Polo ponies, iii, 74.
- Dalglish, Sir William Ogilvie, breeder of Highland cattle, i, 92.
- Dalmatians, vi, 110.
- Darling*, Clydesdale, iii, 8.
- Darnley*, Clydesdale, iii, 7-9.
- Dartmoor ponies, iii, 58-60.
- Dartmoor sheep, iv, 32-4.
- Darwin, Charles, i, 4, 7, 9, 11; vi, 171-4.
- Dauncey, Philip, breeder of Jerseys, i, 96.
- Davidson, James, introducer of Shorthorns to America, i, 145.
- Denmark*, Hackney, iii, 40.
- Depraved appetite, in cattle, ii, 182.
- Derbyshire Gritstone sheep, iv, 34-5.
- Devon cattle, i, 56-60; origin, i, 56; ii, 204; weights, i, 56; aggregate number, i, 57; habits, i, 57; milking capacity, i, 57-8; bulls, i, 58; cows, i, 59; crosses, i, 59; grazing, i, 59; exportations, i, 59; prices and markets, i, 60; as beef producers, i, 242, 249.
- Dexter cattle, i, 105-11; origin, i, 105-7; description, i, 108; as milkers, i, 108; crosses, i, 108-9; weights, i, 110; herd books, i, 110-1; as beef cattle, i, 242, 245.
- Dexter Shorthorn, breed of cattle, i, 109.
- Diabetes, in cattle, ii, 190.
- Diamonds, in pigs, v, 122-3.
- Diarrhoea, in foals, iii, 243; in pigs, v, 108-10; in poultry, v, 263; in dogs, vi, 151.
- Difficult labour, in pigs, v, 126-7.
- Digestive diseases, in sheep, iv, 248-9; in poultry, v, 260-9.
- Dilatation, in cattle, ii, 178.
- Diphtheria, in poultry, v, 261.
- Disease, hereditary, i, 10.
- Diseased growths, in cattle, ii, 253-4.
- Disinfection, of cattle, ii, 262; of poultry, v, 250-3.
- Distemper, in dogs, vi, 151; in ferrets, vi, 166.
- Distention of the crop, in poultry, v, 261-2.
- Docking, in sheep, iv, 244.
- Dactor*, Jersey cow, i, 100.
- Dogs, vi, 101-56; origin, vi, 103-5; in historical times, vi, 105-6; in agriculture, vi, 106; breeds, vi, 107-34; management, vi, 134-40; breeding, vi, 140-6; diseases, vi, 146-56.
- Dogs, breeding of, vi, 140-6; puppies, vi, 142-3; mating, vi, 143-4; training, vi, 144-6.
- Dogs, diseases of, vi, 146-56.
- Dogs, management of, vi, 134-40; kennels, vi, 134-5; bedding, vi, 135-7; exercise, vi, 137-8; foods and feeding, vi, 138-9.
- Dorking fowl, v, 159-61.
- Dorset Down sheep, iv, 37-8.
- Dorset Horn sheep, iv, 38, 41.

- Drew, Laurence, of Merryton, breeder of Clydesdales, iii, 6, 8, 96-7.
- Dropsy, in cattle, of the belly, ii, 187; of the lungs, ii, 242.
- Druce, A. F., breeder of Oxford Downs, iv, 64-5.
- Drumflower Farmer*, Clydesdale, iii, 7.
- Duchess family of Shorthorns, i, 143, 145, 205, 226.
- Ducie, Earl, breeder of Shorthorns, i, 143.
- Duckham, Thomas, writer on Hereford cattle, i, 85.
- Ducks, breeds of, v, 166-72.
- Dugeon, Mr., of Crackatig, breeder of Cheviots, iv, 29.
- Duke of Connaught*, Welsh Black bull, i, 186.
- Dun, Mr., of Kirkton, breeder of Black-face sheep, iv, 19.
- Duncan, T., breeder of Jerseys, i, 96.
- Duncombe, A. C., breeder of Shire horses, iii, 15.
- Dunleath, Lady, breeder of goats, vi, 92.
- Dunmore, Earl of, breeder of Clydesdales, iii, 6.
- Dunmore Prince Charlie*, Clydesdale, iii, 8.
- Dunsmore Chessie*, Shire mare, iii, 93.
- Durham Ox*, Shorthorn, ii, 60.
- Dykes, Thomas, first secretary Clydesdale Horse Society, iii, 6.
- Dysentery, in cattle, ii, 183; in bees, vi, 48-9.
- Dyspepsia, in dogs, vi, 151.
- E**
- Easby, George, horse breeder, iii, 141-2.
- East of Scotland College of Agriculture, ii, 148, 150-1.
- Eastwood Eminent*, Collie, vi, 110.
- Eclipse*, Lincoln Red bull, i, 117.
- Eclipse*, South Devon bull, i, 174.
- Eclipse*, Thoroughbred, iii, 53.
- Eczema, in cattle, ii, 218; in pigs, v, 123; in dogs, vi, 151-2.
- Eden, Peter, breeder of pigs, v, 3.
- Edwards, Mr., of Schoombie, Cape Colony, breeder of cattle, i, 116.
- Edwards-Ker, Dr., breeder of Old English sheep dogs, vi, 119.
- Elliot, Messrs. Thomas and John, breeders of Cheviots, iv, 28.
- Ellman, John, breeder of Southdowns, iv, 2, 79, 139.
- Emden goose, v, 172.
- English Game fowl, v, 161-2.
- Enteritis, infectious, in poultry, v, 263-4.
- Environment, importance of in stock breeding, i, 12; ii, 6, 44, 200.
- Epilepsy, in cattle, ii, 212-3.
- Ergotism, in cattle, ii, 171-2.
- Erica*, Aberdeen-Angus cow, i, 35, 37-8, 41.
- Erskine's Farmer's Fancy*, Clydesdale, iii, 3.
- Erysipelas, in cattle, ii, 225; in pigs, v, 103.
- Escutcheon of cows, i, 230-1.
- Evans, Morgan, breeder of Welsh Blacks, i, 185, 188.
- Evens, J., of Burton, breeder of Lincoln Reds, i, 117-8.
- Everlasting*, Aberdeen-Angus bull, i, 29.
- Eversion of the womb, in sheep, iv, 237.
- Ewart, Professor Cossar, i, 13; iii, 52, 77.
- Ewen, H. F., founder of Red Poll Society, i, 126.
- Exmoor ponies, iii, 61-3.
- Exmoor sheep, iv, 41-3.
- F**
- Falling sickness, in pigs, v, 115-6.
- Family system, in breeding, i, 30.
- Farmer*, alias *Sproutston*, Clydesdale, iii, 3.
- Farmer's Fancy*, Clydesdale, iii, 4, 8.
- Farmer's Glory*, Shire, iii, 5-6.
- Farrer, Sir George, Bedford, Transvaal, cattle breeder, i, 116.
- Fats and oils, in cattle food-stuffs, ii, 70, 78.
- Faverolles fowl, v, 150-1.
- Favourite*, Shorthorn bull, i, 114, 196; ii, 52, 56.
- Fawcley Fill-pails*, Shorthorn dairy cow, ii, 27.
- Feet soft, in dogs, vi, 152.

- Fell ponies, iii, 63-5.
- Fergusson, Mr., of Kinochtry, breeder of Aberdeen-Angus, i, 35.
- Ferrets, vi, 157-69; varieties, "polecat" and "white", vi, 158-9; accommodation, vi, 159-61; feeding, vi, 161; breeding, vi, 162-3; training, vi, 163-4; working, vi, 165; lining, vi, 165-6; hints in working, vi, 166-7; diseases, vi, 167-9.
- Fever in the feet, in cattle, ii, 247-8; in pigs, v, 129-30.
- Field Marshal, Shorthorn bull, i, 146.
- File, Charles, Canterbury, breeder of Romney Marsh sheep, iv, 53.
- Fireaway, Hackney, iii, 40.
- Fisher, John, breeder of pigs, v, 16.
- Fits, in cattle, ii, 212-3; in pigs, v, 115-6; in dogs, vi, 149.
- Fitzherbert, early writer on agriculture, v, 75.
- Flannagan, Matthew, secretary, Roscommon Sheep-breeders' Association, iv, 70.
- Fluke disease, in sheep, iv, 160-9.
- Flying Fox, racing winner, i, 23.
- Foaling and attendant diseases, iii, 227-43.
- Foot-and-mouth disease, in cattle, ii, 163; in sheep, iv, 212-4; (or aphthous fever), in pigs, v, 104.
- Foot-lameness or foot-sore, non-contagious foot-rot, in sheep, iv, 225-8.
- Foot-rot, in sheep, iv, 219-25; in ferrets, vi, 166-7.
- Forging, in horses, iii, 252-3.
- Forshaw, James, owner of Shire stallions, iii, 97.
- Forster, Wm., of Mel Valley, breeder of Harness ponies, iii, 65.
- Fortescue, Earl, breeder of Exmoor ponies, iii, 63.
- Foul brood or bee pest, vi, 49-55.
- Foul of the foot, loo, or low, in cattle, ii, 248-50.
- Fourth stomach worms, in sheep, iv, 174-8.
- Fowler, Michael, early breeder of Jersey cattle, i, 96.
- Fowls, breeds of, v, 138-66.
- Foxhounds, vi, 111.
- Foyers, Messrs., of Knowhead, breeders of Blackface sheep, iv, 19.
- Freeland, Oxford Down ram, iv, 65.
- Frenz, in cattle, ii, 216.
- Freshney, T. B., breeder of Lincoln Reds, i, 117.
- Friesian or Holstein-Friesian cattle, i, 51-6; milk records, i, 52-3; beef producers, i, 53.
- Fuchsia, Lincoln Red dairy cow, i, 118.
- Fullerton, Mr., of Ardvie, breeder of Aberdeen-Angus, i, 35-6.
- Fullerton, greyhound, vi, 114.

G

- Galbraith, Alexander, of Croy-Cunningham, breeder of Clydesdales, iii, 6.
- Galliers, family of, breeders of Herefords, i, 78.
- Galloway, Earls of, breeders of Galloways, i, 62.
- Galloway Agricultural Society, i, 63.
- Galloway cattle, aggregate number, i, 57; description and origin, i, 60-2; prices, i, 63, 68; breeding and rearing, i, 64-5; staple foods, i, 65-6; prominent breeders, i, 67; markets, i, 68, 244; as beef cattle, i, 244-5; crosses with Shorthorns, i, 244-5.
- Galloway Cattle Society, i, 64.
- Ganson, R. D., breeder of Shetland cattle, i, 137.
- Garforth, Leeds University Experimental Station, ii, 33, 146.
- Garget, in cattle, ii, 205-7; in pigs, v, 130.
- Gastritis, in pigs, v, 110-1; in poultry, v, 263.
- Geese, breeds of, v, 172-4.
- General, Clydesdale, iii, 8.
- Gerard, Lord, breeder of Longhorns, i, 123.
- Germ plasm theory of heredity, i, 4-9.
- Gid, in sheep, iv, 186-90; false, iv, 190-2.
- Gilbey, Sir Walter, breeder of Shire horses and Jersey cattle, i, 96; iii, 11, 30.
- Gilbey, Tresham, breeder of Polo ponies, iii, 74.

- Gilchrist, Homer, breeder of Galloways, i, 67.
- Gillespie, Rev. Dr., authority on Galloways, i, 63.
- Gillet, Mr., breeder of Oxford Downs, iv, 64.
- Glancer*, Clydesdale, iii, 2-3, 5.
- Glasgow Agricultural Society, iii, 6-7.
- Glass eye, in cattle, ii, 212.
- Glassy eyes, in dogs, vi, 148.
- Glead's Horse*, Suffolk, iii, 22.
- Glenelg*, Clydesdale, iii, 5.
- Goats, breeds of, vi, 66-72; English, vi, 66-7; Anglo-Nubian, vi, 67-8; Swiss (Toggenburgs and Saanens), vi, 68-71; cross-bred, vi, 71-2; selection of a breed, vi, 72; management of, vi, 72-100; conditions, vi, 72-3; goat-house, vi, 73-4; stalls, vi, 74; advantage of commons, vi, 75; loose-boxes and stables, vi, 75; feeding and care of, vi, 75-6; garden produce as food, vi, 76-7; dry food, vi, 77; rations, vi, 78; pasturage and tethering, vi, 78-9; water and salt, vi, 79; cost of feeding, vi, 79-80; grooming and hoof pating, vi, 80-1; breeding, vi, 81-2; stud goats, vi, 82-3; mating, vi, 83; treatment when kidding, vi, 84; rearing kids, vi, 84-6; hermaphrodite kids, vi, 86-7; milking, vi, 87-8; maiden goats in milk, vi, 88; milk and its uses, vi, 89-90; yields of milk, vi, 90; milk and tuberculosis, vi, 92-3; profit and loss, vi, 93-6; exhibiting, vi, 96; hints to secretaries and stewards, vi, 97-8; hints to exhibitors, vi, 98-9; milking competitions, vi, 99-100; dual-purpose prizes, vi, 100.
- Going light, in poultry, v, 264-5.
- Goitre, in cattle, ii, 172-3.
- Gonorrhoea, in cattle, ii, 200-1.
- Good Friday*, Mr. F. Millar's bull, i, 119.
- Gourlay, F. N. M., breeder of Galloways, i, 67.
- Governor*, Mastiff, vi, 116.
- Grownby*, Polo pony, iii, 74.
- Graham, Robert, breeder of Galloways, i, 67.
- Graham, Sir James, of Netherby, i, 63.
- Graham, Tom, breeder of Galloways, i, 67.
- Grant, George, breeder of Aberdeen Angus, i, 40.
- Grant, Mr., of Wyham, breeder of Lincoln Reds, i, 114.
- Gravel, in pigs, v, 120-1.
- Gray, Henry, avian pathologist, v, 249.
- Grease, in horses, iii, 218-9.
- Great Danes, vi, 112-3.
- Greenwell, Sir Walpole, breeder of Shire horses, iii, 15, 19.
- Grepe, Hamilton, of South Africa, breeder of South Devons, i, 169, 174.
- Gresley, Sir Thomas, breeder of Longhorns, i, 121.
- Grey-breasted Jock*, Aberdeen-Angus bull, i, 40.
- Grey Comet*, Clydesdale, iii, 5.
- Greyhounds, vi, 113-5.
- Grisdale, Prof., authority on pigs, v, 68.
- Grooming of cattle, ii, 261.
- Growths on the eye, in cattle, ii, 212.
- Guenon, François, French cattle-scientist, i, 230-1.
- Guernsey cattle, aggregate number, i, 57; description and origin, i, 68-9; exportations, i, 70; characteristics, i, 70-1; rearing and feeding, i, 71-2; prices and markets, i, 73; scale of points, i, 75-6.
- Gunter, Captain, breeder of Shorthorns, i, 145.

H

- Hackney horses, iii, 37-42.
- Hæmorrhage of the womb, in mares, iii, 238-9.
- Hague, David, breeder of Lonk sheep, iv, 64.
- Hall, J. F., breeder of Jerseys, i, 96.
- Halstead Royal Duchest*, Shire mare, iii, 93.
- Hamburg fowl, v, 140-1.
- Hamilton, sixth Duke of, iii, 1.
- Hamilton, Prof., of Aberdeen, iv, 203-4, 207-8, 211.
- Hammond, Mr., of Bale, breeder of Red Polls, i, 127.
- Hammond and Crawford, secretaries of Kerry and Dexter Society, i, 111.

- Hampshire Down sheep, iv, 44-7.
 "Handle", of cattle, i, 141, 164, 196, 199, 229, 232, 252.
- Hanton*, Aberdeen-Angus bull, i, 36.
- Harness ponies, iii, 65-7.
- Harold*, Shire stallion, iii, 14.
- Harold*, Shorthorn bull, i, 141, 146.
- Harper Adams Agricultural College, v, 156.
- Harriers, vi, 107.
- Harrington, Lord, breeder of Polo ponies, iii, 74.
- Hart, Mr., breeder of Southdowns, iv, 79.
- Hartland, Sir Robert, breeder of Suffolks, iii, 21.
- Harvey, R. H., writer on Welsh Blacks, i, 187-8.
- Harvieston Baroness*, Clydesdale mare, iii, 93.
- Hawthorns, of Castlerigg, breeders of Galloways, i, 62.
- Heaseman, Messrs., of Arundel, breeders of Sussex cattle, i, 180.
- Heaton, Captain, breeder of pigs, v, 3.
- Henderson, Robert, breeder of pigs, v, 76-7.
- Henderson, Sir Alexander, breeder of Shires, iii, 15.
- Hendrick, Prof., of Aberdeen, ii, 95, 144.
- Hendrie's Farmer's Glory*, Shire horse, iii, 5-6.
- Hercules*, Lincoln Red bull, i, 116.
- Herdwick sheep, iv, 47-9.
- Hereford cattle, i, 76-85; aggregate number, i, 57; origin and description, i, 76-8, 204; ii, 3; prize-wimmers, i, 79; introduction to Colonies and foreign countries, i, 79-80; as ranch cattle, i, 80, 248; weights, i, 80; as milkers, i, 81; bulls, i, 82-3; crosses, i, 83; prices, i, 83-4; points for bull, i, 84.
- Hernia, ventral, in cattle, ii, 183-4; broken, or burst, in pigs, v, 113-4.
- Hewers, family of, breeders of Hereford cattle, i, 78.
- Highland cattle, aggregate number, i, 57; origin and description, i, 86-8; early breeders, i, 88; breeding and rearing, i, 89-90; crosses, i, 90-1; in Western Canada and Newfoundland, i, 91; prices and markets, i, 91; weights, i, 92; colour, i, 93.
- Highland ponies, iii, 67-9.
- Hill, Christopher, breeder of the Blackwell Ox, ii, 4.
- Hill, Frederick, authority on Polo ponies, iii, 74.
- Hill, John, authority on Polo ponies, iii, 74.
- Hislop, William, breeder of belted Galloways, i, 67.
- Hobbs, Fisher, breeder of pigs, v, 3.
- Hobbs, Mr., breeder of Oxford Downs, iv, 64.
- Hodgson, Lumley, breeder of Cleveland Bays, iii, 30-1, 44.
- Holderness breed of cattle, ii, 3, 7.
- Holstein cattle, i, 51-6; origin and description, i, 51-2; as milkers and beef producers, i, 53-4; crosses, i, 55; prices and markets, i, 55.
- Honaopathist*, Hunter, iii, 47.
- Hoose, in cattle, ii, 243-6; in sheep, iv, 179-83.
- Hope, the Ladies, breeders of Shetland ponies, iii, 78.
- Hope-Johnston, Mr., of Annandale, breeder of Galloways, i, 63.
- Horses, breeds of, iii, 1-83; heavy horses, iii, 1-28; light horses and ponies, iii, 29-83.
- Horses, diseases of, iii, 167-259; hereditary, iii, 167-201; common, iii, 201-20; parasites, iii, 220-7; attending foals, iii, 227-43; attending shoeing, iii, 243-55; hints to horse-owners, iii, 256-9.
- Horses, management and feeding of heavy horses, iii, 84-139; mares, iii, 88-93; stallions, iii, 94-8; colts, iii, 98-102; young stallions, iii, 102-6; hiring stallions, iii, 107-11; foals, iii, 111-9; growing colts, iii, 119-25; working farm horses, iii, 125-35; street horses, iii, 135-7; profitable breeding for farmers, iii, 137-9.
- Horses, management and feeding of light horses, iii, 141-66; brood mares and young stock, iii, 141-6; foals, iii, 147-56; young horses, iii, 156-9; showing, iii, 159-60; breaking and marketing,

iii, 160-3; feeding, 163-4; profitable breeding, iii, 165-6.

Houdan fowl, v, 141-2.

Housing of cattle, ii, 16; light and air in ventilation, ii, 18-9; dairy cattle, ii, 35-7; calves, ii, 92-3; for winter fattening, ii, 135-7; sanitation, ii, 259-63; disinfection, ii, 262.

Hoven, in cattle, ii, 178; in sheep, iv, 249.

Howatson, Charles, breeder of Blackface sheep, iv, 19.

Huish, Messrs., Red Lion Square, surgical-instrument makers, ii, 245.

Hull, E., of Rhodesia, i, 116.

Hume, Mr., president Royal Jersey Society, i, 95.

Humphrey, Mr., breeder of Hampshire Down sheep, iv, 45.

Hunter, Mr., of Clenocher, breeder of Cheviots, iv, 29.

Hunting horses, iii, 42-50; definition, iii, 42-4; breeding, iii, 44-9; classification, iii, 49.

Husk, in cattle, ii, 243-6; in sheep, iv, 179-83.

Hydatid in the brain, in sheep, iv, 186-90.

I

Icterus, in cattle, ii, 188.

Impaction of paunch, in cattle, ii, 179; of third stomach, in cattle, ii, 179-80; in sheep, iv, 250.

Impotence, in cattle, ii, 193.

Inbreeding and line breeding, i, 20-4; by Hugh Watson of Keillor, i, 34-5; by Bakewell, i, 195; ii, 56; by the Collings, i, 196; ii, 56.

Indian Game fowl, v, 162-3.

Indian Runner, duck, v, 168-9.

Inflammation of the belly, in cattle, ii, 186-7; of the kidneys, in cattle, ii, 191; of the bladder, in cattle, ii, 191-2; of the womb, in cattle, ii, 201-2; infectious, of the eye, in cattle, ii, 211; of the lungs, in cattle, ii, 239-40; of the womb, in mares, iii, 235; of the vagina, in mares, iii, 236-7; of the feet, in mares, iii, 237; of the udder, in mares, iii, 238; of the stomach (gas-

tritis), in pigs, v, 110-11; of the lungs, in poultry, v, 257; of the bowels, in dogs, vi, 149.

Inheritance; "sex limited", i, 3; acquired characters, i, 9; Mendel's law, i, 14-5.

Injuries from nails, in horses, iii, 254-5.

Interfering, in horses, iii, 251-2.

Inversion of the womb, in mares, iii, 239-40.

Irish store cattle, ii, 8-10.

Isle of Wight disease, in bees, vi, 55-7.

Italy, live stock improvement in, i, 210-3.

Itch, mange, and scabies, in pigs, v, 124-5.

J

Jack, Mr., of Balcunnoch, breeder of Clydesdales, iii, 8.

Jardine, Sir Robert, breeder of Galloways, i, 67.

Jaundice, in cattle, ii, 188.

Jeffrey, Mr., of Deuchrie, breeder of Cheviots, iv, 29.

Jeffries, family of, breeders of Herefords, i, 78.

Jersey cattle, aggregate number, i, 57; origin and description, i, 94-5; improvement and early breeders, i, 96; butter tests and results, i, 96; exportations, i, 97; milk and butter qualities, i, 97, 200; sires, i, 98; management and feeding, i, 98-9; crosses and markets, i, 99-100; prices, i, 100; points, i, 100.

Jersey-Angus cattle, ii, 23-4.

Jersey Parish Club shows, i, 95.

Jilt, Aberdeen-Angus cow, i, 38.

John's disease, in cattle, ii, 182-3.

Johnson, Walter, owner of Shire stallions, iii, 97.

Johnston, Mr., of Archbank, breeder of Cheviots, iv, 28.

Jones, Bryner, Professor of Agriculture, i, 185; ii, 33.

Jones and Son, Llandudno, breeders of Harness ponies, iii, 66.

Jura fold of Highlanders, i, 88.

K

- Keds, in sheep, iv, 199.
 Keillor breed of Angus cattle, i, 35; ii, 45.
Keir Peggy, Clydesdale, iii, 8.
 Kennedy, Colonel, breeder of Galloways, i, 67.
 Kent or Romney Marsh sheep, iv, 50-3.
 Kerrison, Sir Edward, breeder of Red Polls, i, 127.
 Kerry cattle, i, 102-11; origin, i, 102-4; description, i, 107-8; as milkers, i, 108; crosses, i, 108-9; weights, i, 110; herd books, i, 110-1.
 Kerry Hill (Wales) sheep, iv, 53, 55.
Khaki Campbell, duck, v, 167.
 Kibe, in cattle, 248-50.
King Louis, Lincoln Red bull, i, 119.
 Kingdom, Mr., breeder of Mastiffs, vi, 116.
 Kingscote, Colonel Sir N., breeder of Southdowns, iv, 80.
 Kirkcaldy, Mr., Galway, cattle breeder, i, 40.
 Knight, John, early breeder of Exmoor ponies, iii, 62-3, 65.
 Knight, Sir Frederick, early breeder of Exmoor ponies, iii, 63.
 Knight, T. A., Downton Castle, early breeder of Herefords, i, 78.
 Knightley, Sir Charles, breeder of dairy Shorthorns, ii, 27.

L

- La Bresse, fowl, v, 165-6.
 La Fleche, fowl, v, 166.
Lady Ida, Aberdeen-Angus cow, i, 41.
Lady Maynard, cow, founder of Shorthorn breed, i, 114.
Lady Peggy, Clydesdale, iii, 93.
 Lamarck's theory of evolution, i, 11.
 Lameness, in horses, iii, 219-20.
 Laminitis, in cattle, ii, 247-8.
 Lamont, Mrs., of Toward, breeder of Clydesdales, iii, 9.
Lampit's Mare, Clydesdale, iii, 2.
 Land Court of Scotland, i, 205, 219.

- Lane, Mr., of Limavady, breeder of Galloways, i, 67.
 Langshan fowl, v, 151-2.
 Large Black pig, v, 11-5.
 Large White pig, v, 15-9.
Large Jock, Clydesdale, iii, 4-5.
 Laryngitis, in cattle, ii, 235-6.
 Lawra, cow, founder of Shorthorn breed, i, 114.
 Lawes, Sir John, breeder of pigs, v, 70.
 Le Cornu, Colonel, breeder of Jerseys, i, 95.
 Le Couteur, Colonel, breeder of Jerseys, i, 95.
 Lead poisoning, in cattle, ii, 216.
Leazes Eve, goat, vi, 91-2, 100.
 Lee, the Laird of, breeder of Clydesdales, iii, 4.
 Legh, family of, breeders of Mastiffs, vi, 116.
 Leghorn fowl, v, 142-4.
 Leicester sheep, iv, 56-8.
Leonard, Shorthorn bull, ii, 45.
Leonidas, Shorthorn bull, i, 148, 166.
 Leucorrhoea, in mares, iii, 237.
 Lice, in cattle, ii, 224; in horses, iii, 221-2; in sheep, iv, 198-9.
 Limestone sheep, iv, 58-60.
 Lincoln sheep, iv, 60-2.
 Lincolnshire Curly-coated pig, v, 19-21.
 Lincolnshire Red Shorthorn cattle; aggregate number, i, 57; origin, i, 111-4; improvement, i, 114-6; crosses and famous breeders, i, 116-8; prices, i, 119.
Linda III, Red Poll cow, i, 128, 132.
 Linseed cake, ii, 149.
 Linton, William, breeder of Shorthorns, i, 146.
 Lisle, Edward, early writer on agriculture, v, 75.
 Liver-rot, in sheep, iv, 160-9.
Lochfergus Champion, Clydesdale, iii, 3.
 Locke, Dr., breeder of Old English sheep dogs, vi, 119.
 Lockerbie Farmers' Club, i, 63.
Lockinge Forest King, Shire horse, iii, 15.
Lockinge Loiret, Shire horse, iii, 15.
London Maggie, Clydesdale, iii, 8-9.

- Londonderry, Marquis of, breeder of Shetland ponies, iii, 78.
- Long, Professor James, writer on agriculture, i, 227; v, 31.
- Longhorn cattle, i, 120-4; origin, i, 120-1; early breeding and breeders, i, 121; as dairy and beef cattle, i, 122-3; bulls, i, 123.
- Lonk sheep, iv, 62-4.
- Loo, or low, in cattle, ii, 248-50.
- Lord Bolingbroke, Shorthorn bull, i, 196.
- Lord Erskine, Clydesdale, iii, 7.
- Lord Lyon, Clydesdale, iii, 7.
- Lord Willon, Hereford bull, i, 83.
- Lorna Doone, Shire mare, iii, 93.
- Lorne, Clydesdale, iii, 4.
- Louping ill, in sheep, iv, 203-6.
- Lowe, G. S., writer on Exmoor ponies, iii, 61-2.
- Lukey, Mr., breeder of Mastiffs, vi, 116.
- Lung-worms, in sheep, iv, 179-83.
- M**
- M'Carthy, Justin, breeder of Spaniels, vi, 123.
- M'Combie, William, of Tillyfour, breeder of Aberdeen-Angus cattle, i, 36-9, 198.
- M'Conchie, William, breeder of Galloways, i, 67.
- M'Cullochs of Ardwell, breeders of Galloways, i, 62.
- M'Donald, Ranald, breeder of Highland cattle, i, 87.
- M'Douall, Colonel, of Logan, breeder of Clydesdales, iii, 3.
- M'Kenzie, Kenneth, of Cambridge, authority on pigs, v, 45.
- M'Kenzie, R. W. R., breeder of Shetland cattle and ponies, i, 134, 137; iii, 78.
- M'Kerrow, Mr., of Boreland, breeder of Cheviots, iv, 29.
- M'Kersie, Mr., of Glenbuck, breeder of Blackface sheep, iv, 19.
- Macpherson-Grant, Sir George, breeder of Aberdeen-Angus cattle, i, 35, 37-9.
- M'Turk, W. A., breeder of Galloways, i, 67.
- Magdalena, Shorthorn heifer, ii, 27.
- Maggot or sheep-fly, in sheep, iv, 199-200.
- Magnus Troil, Shorthorn bull, i, 146.
- Maitlands of Dundrennan, breeders of Galloways, i, 62.
- Malpresentations, in cattle, ii, 195-9.
- Mambrino, Thoroughbred, iii, 38.
- Mammitis, in cattle, ii, 205-7; in sheep, iv, 237-40; or garget, in pigs, v, 130.
- Manager, South Devon bull, i, 174.
- Mange, in cattle, ii, 223-4; in horses, 222; sarcoptic, in horses, iii, 222-3; psoroptic, in horses, iii, 223; chorioptic, in horses, 223-4; in pigs, v, 124-5; in dogs, vi, 152; in ferrets, vi, 167.
- Manure, constituents of and method of valuing, ii, 79-80.
- Mario, Shorthorn bull, i, 146.
- Markeaton Royal Harold, Shire horse, iii, 15.
- Markham, Gervaise, early writer on agriculture, v, 75.
- Marr, William, breeder of Shorthorns, i, 147.
- Marshall, Professor, of Cambridge, v, 45.
- Marske, Thoroughbred, iii, 52, 70.
- Martin, Mr. John M., breeder of Clydesdales, iii, 6.
- Mascal, Leonard, early writer on agriculture, v, 75.
- Mason, Christopher, breeder of Lincoln Reds, i, 115.
- Master M'Grath, Greyhound, vi, 114.
- Master of the Realm, Shorthorn bull, i, 147.
- Mastiffs, vi, 115-7.
- Maternal impressions, i, 13.
- Matthews, A. B., breeder of Galloways, i, 67.
- Maxwell, Sir Wm. Stirling, of Keir, breeder of Clydesdales, iii, 8.
- Maxwells of Monreith, breeders of Galloways, i, 62.
- Maxwells of Munches, breeders of Galloways, i, 62.
- May pest, in bees, vi, 57.
- Medication of cattle, ii, 263.
- Meire,* Samuel, of Berrington, breeder of Shropshires, iv, 74.

- Melody*, dairy Shorthorn cow, i, 225.
- Mendel, Gregor, i, 14.
- Mendelism, i, 14-20; examples of matings, i, 14-8; iv, 131; theory of, i, 16-7; in stock-breeding, i, 19; in determination of sex, i, 20; inbreeding and line breeding, i, 20-4; in cattle improvement, i, 203; ii, 22, 24.
- Merry Moment*, Polo pony, iii, 75.
- Merry Tom*, Clydesdale, iii, 5, 8.
- Michelmore, Alfred, first secretary South Devon Herd-book Society, i, 168.
- Midas*, Shorthorn bull, i, 141.
- Middleton, Lord, breeder of Shire horses, iii, 15.
- Middle White pig, v, 22-4.
- Milk, breeding for, ii, 30; regulations for composition, ii, 32-5; experimental stations, ii, 33-4; handling of, ii, 40-2; sterilization, ii, 40-1; certified milk, ii, 41; selling of, ii, 42-3.
- Milk fever, in cattle, ii, 202-4; in pigs, v, 128-9; or puerperal, in dogs, vi, 152.
- Milk substitutes, ii, 100-1.
- Mills, John, early writer on agriculture, v, 75.
- Mineral matter, in cattle food-stuffs, ii, 67-8.
- Minorca fowl, v, 144-5.
- Moffat, Mr., of Craik, breeder of Cheviots, iv, 28.
- Moffat, Mr., of Garwald, breeder of Cheviots, iv, 28-9.
- Monarch*, Aberdeen-Angus hull, i, 36.
- Montgomery, Andrew, breeder of Clydesdales, iii, 97.
- Moore, Henry, breeder of Hackneys, iii, 41.
- Mortimer, Miss, breeder of goats, vi, 91.
- Morton, Lord, early horse-breeder, vi, 172.
- Mould disease, or aspergillosis, in poultry, v, 259-60.
- Mud fever, in horses, iii, 216-7.
- Muir, Messrs. John and James, breeders of Clydesdales, iii, 3.
- Muircock*, Clydesdale, iii, 3.
- Mules, vi, 175-6.
- Mundel, Messrs., of Dalchorch, breeders of Cheviots, iv, 29.
- Muntz, Sir Albert, breeder of Shire horses, iii, 15.
- Murray, Mr., of Parkhall, breeder of Cheviots, iv, 28.
- Murrays, of Cally, breeders of Galloways, i, 62.
- Muscovy duck, v, 169-70.
- Mutations, i, 7, 8.
- Mutton, production of, iv, 115-20.
- Myelitis, in cattle, ii, 216.

N

- Nancy I*, Lincoln Red cow, i, 118.
- National Poultry Organization Society, v, 230.
- Navel-ill*, in cattle, ii, 185-6; in foals, iii, 240-2; in sheep, iv, 240-2.
- Navel rupture, in cattle, ii, 184-5.
- Navicular disease in horses, iii, 183-6.
- Neilson, Montgomery, breeder of Galloways, i, 67.
- Nelson, Messrs., of Liverpool and Buenos Aires, i, 146-7.
- Nettle rash, urticaria, in pigs, v, 121-2.
- New Forest ponies, iii, 69-71.
- Newfoundland dogs, vi, 117-8.
- Nichol's Topsman*, Shire, iii, 5.
- Nielsen, Ivar, Norwegian Government veterinary officer, iv, 208.
- Norfolk Black turkey, v, 175.
- Norfolk Drovers, i, 32.
- Norfolk Polls, i, 31.
- North, Colonel, owner of Greyhounds, vi, 114.
- North Star*, Shorthorn bull, i, 141.
- Nutrition, general principles of, for animals, ii, 65-90; nitrogenous constituents of food-stuffs, i, 68-70; non-nitrogenous, ii, 70; digestion, ii, 72-5; general functions of food, ii, 75-6; availability of feeding-stuffs, ii, 76-8; special functions of the various food constituents, ii, 78-9; manurial value of feeding-stuffs, ii, 79-81; methods of valuing feeding-stuffs, ii, 81-5; albuminoid ratio of feeding-stuffs, ii, 85-7; "starch equivalent" of feeding-stuffs, ii, 87-9.
- Nymphomania, in cattle, ii, 217.

O

- Obstruction of the throat, in poultry, v, 261.
 Oettingen, Baron von, authority on horse-breeding, iii, 51.
 Offerton Hall, milk experimental station, ii, 33-4, 108, 114-5.
 Old English sheep dogs, vi, 118-9.
Old Farmer, Clydesdale, iii, 3.
Old Grannie, Aberdeen-Angus cow, i, 34.
Old Jock, Aberdeen-Angus bull, i, 34-6, 40.
Old Tibbie, Clydesdale, iii, 3.
Old Times, Clydesdale, iii, 7.
Old Traveller, Cleveland Bay, iii, 31.
Old Trotting Comet, Welsh cob, iii, 83.
 Old Welbourne Reds, herd of Lincoln Reds, i, 117.
 Oliver, Mr., of Eresby, breeder of Lincoln Reds, i, 115.
 Ophthalmia, in cattle, ii, 210.
 Organic matter, in cattle food-stuffs, ii, 68-71.
 Ormerod, L. W. H., breeder of Lonk sheep, iv, 64.
 Orpington duck, v, 170.
 Orpington fowl, v, 152-3; buff, v, 153-4; white, v, 154; jubilee, v, 154; spangled, v, 154.
 Osbaldeston, Mr., breeder of Cleveland Bays, iii, 31.
 Osborne, Joseph, breeder of Thoroughbreds, iii, 53.
Othra, Polo pony, iii, 32, 74.
 Otter breed of sheep, i, 6-7.
 Ouseley, Sir Gore, early horse-breeder, vi, 172-3.
 Overgrown feet, in horses, iii, 247.
 Overgrown nails, in ferrets, vi, 167.
 Overloading, or impaction of paunch, in cattle, ii, 179.
 Overreach, in horses, iii, 253.
 Oxford Down sheep, iv, 64-8.

P

- Padwick, H., breeder of Southdowns, iv, 70.
 Palladius, early writer on agriculture, v, 75.

- Pangenesis, i, 4.
 Panmure, Lord, breeder of Aberdeen-Angus, i, 36.
 Paralysis, in cattle, ii, 213; in bees, vi, 47.
 Parasites of the liver, in cattle, ii, 188; of the skin, in poultry, v, 266.
 Parturition in sheep, iv, 228-34.
 Pastures for cattle, ii, 130-2.
 Paterson, John, of Lochlyoch, founder of Clydesdale breed of horses, iii, 1-2.
 Pease, Mr. and Mrs. Reginald, breeders of goats, vi, 68.
 Pedigrees in breeding, i, 28-30.
 Pedigree stock-breeding, ii, 43-63; **genera**. remarks, ii, 43-7; starting a herd, ii, 47-52; points for bull, ii, 52; feeding, ii, 53-4; management of a herd, ii, 52-4; in-breeding and line breeding in, ii, 56-7; fashionable pedigrees, ii, 57; treatment to combat tuberculosis, ii, 58; methods of selling, ii, 59-61.
 Pekin duck, v, 170.
 Penis, ulcers, &c., of, in cattle, ii, 193.
 Peritonitis, in cattle, ii, 186-7.
Phanix, cow, i, 196.
 Pigs, breeds of, v, 1-30.
 Pigs, management and feeding, v, 31-74; sows and young pigs, v, 33-5; type of sow, v, 35-39; first mating, v, 39-41; farrowing, v, 41-2; diet of sow, v, 42-3; exercise, v, 43; mating, v, 44; breeding from first litters, v, 44; castrating and spaying, v, 44-5; boars, v, 45-6; points of good boars, v, 46-8; store pigs, v, 48-9; pigsties, v, 49-51; feeding, v, 52-7; requirements of consumer, v, 57; cooked food for pigs, v, 58-60; soaking of meal, v, 60; feeding meal dry, v, 61; vegetable food, v, 61-4; pigs and dairying, v, 64-6; experiments on pig-feeding, v, 66-72; summer and winter fattening, v, 73-4; diseases of, v, 101-34.
 Pip, in poultry, v, 260.
 Pitfour stallions, iii, 4.
 Pleurisy, in cattle, ii, 240-1.
 Pleuro-pneumonia, in cattle, ii, 164-5.
 Plymouth Rock fowl, v, 155.

- Pneumonia, in cattle, ii, 239-40; in poultry, v, 259; parasitic, in sheep, iv, 184-6.
- Pointers, vi, 119-20.
- Poitou mules, vi, 175-6.
- Polo ponies, iii, 71-7.
- Pottaloch fold of Highland cattle, i, 87.
- Ponies, breeds of, iii, 57-83.
- Pothery, in sheep, iv, 186-90.
- Poultry, breeds of, 135-75; general remarks, v, 135-8; non-sitting varieties, v, 138-47; general-purpose varieties, v, 147-59; table varieties, v, 159-64; French breeds, v, 165-6; ducks, v, 166-72; geese, v, 172; turkeys, v, 174-5.
- Poultry, diseases of, v, 249-69; of the breathing organs, v, 253-60; of the digestive system, v, 260-6; of the breeding organs, v, 266-7; of the feet and legs, v, 267-8.
- Poultry, feeding of, v, 210-26; chickens, v, 210-5; ducklings, v, 215; young turkeys, v, 216-7; laying-hens, v, 217-24; fattening, v, 224-5.
- Poultry, management of, v, 177-210; rearing of chickens, v, 177; collecting eggs, v, 177-8; choice of eggs for setting, v, 178; care of eggs for setting, v, 178-9; choice of broody hens, v, 179; the sitting-house, v, 179-82; to help out a dry chick, v, 182-3; putting out chicks, v, 183-6; rearing by artificial means, v, 186-94; advantage of artificial rearing, v, 194-6; ducklings, v, 196-7; geese, v, 197-8; turkeys, v, 198-9; laying hens, v, 200-3; housing poultry, v, 203-5; laying-hens at liberty, v, 205-6; age for best laying, v, 206-7; stock ducks, v, 207-8; stock geese, v, 208; turkey management, v, 209-10.
- Poultry, profitable farming of, v, 227-48; egg production, v, 229-34; egg preservation, v, 234-7; table poultry, v, 237-8; chickens, v, 238-40; ducks, v, 240-1; geese, v, 242-3; turkeys, v, 243-4; marketing, 244-5; marketing of eggs, v, 245-6; marketing of dead poultry, v, 246-9.
- Powell, Mr., breeder of Red Polls, i, 127.
- Powis, Earl of, breeder of Shire horses, iii, 19.
- Pride of Aberdeen*, Aberdeen-Angus cow, i, 38.
- Pride of Mulben*, Aberdeen-Angus cow, i, 38.
- Prijvalsky's wild horse, vi, 172-3.
- Prime Scots*, i, 158, 249.
- Primrose*, Jersey cow, i, 226.
- Prince Alexander*, Clydesdale, iii, 9.
- Prince Charlie*, Clydesdale, iii, 3.
- Prince of the Lilies*, Shorthorn bull, i, 147.
- Prince of Wales*, Clydesdale, iii, 6-10, 96.
- Prince Palatine*, Shorthorn bull, i, 148.
- Prince William*, Shire horse, iii, 15.
- Pringle's Young Clyde*, Clydesdale, iii, 4.
- Probangs or choke ropes, ii, 177-8; iv, 249.
- Protector*, Hereford bull, i, 83.
- Proteins (albuminoids), ii, 69, 78.
- Psorospermosis, in poultry, v, 265.

Q

- Quarter III, in cattle, ii, 165-8.
- Quartermaster*, Shorthorn bull, i, 148.
- Quartly, Francis, improver of Devon cattle, i, 197.
- Quayle, Thomas, writer on agriculture, i, 94.
- Queen Mother*, Aberdeen-Angus cow, i, 36.
- Quittor, in horses, iii, 249-50.

R

- Read, Clare Sewell, breeder of Red Polls, i, 125.
- Redcap fowl, v, 145-6.
- Redgrave Hall herd of Red Polls, i, 132.
- Redmile, Mr., of Dyke, breeder of Lincoln Reds, i, 115.
- Red Polls, aggregate number, i, 57; origin, description, and improvement, i, 124-7; characteristics, i, 127-8; weights, i, 128; milk records, i, 128-9; crosses, i, 129-30; exports to Jamaica, i, 130-1; prices, i, 131-3.
- Red water, in cattle, ii, 169-90.
- Rent-paying cattle, i, 145.

- Retention of placentas, in cattle, ii, 199-200.
 Retention of the afterbirth, in mares, iii, 234-5; in pigs, v, 127.
 Retrievers, vi, 120-1.
Rew Style, South Devon bull, i, 170.
 Rheumatism, in cattle, ii, 173-4; in horses, iii, 198-201; in pigs, v, 117-9; in dogs, vi, 154.
 Rhode Island Red fowl, v, 156-7.
 Rickets, in cattle, ii, 252-3; in pigs, v, 119-20; in dogs, vi, 154.
 Riddell, David, breeder of Clydesdales, iii, 8, 91, 97.
 Riley, J. L., and O., breeders of Longhorns, i, 123.
 Rinderpest, in cattle, ii, 163-4.
 Ringbone, in horses, iii, 177-9.
 Ringworm, in cattle, ii, 222; in dogs, vi, 154.
 Risdon, John, sec. Devon Cattle Breed Society, i, 60.
 Roaring and whistling, in horses, iii, 168-72.
 Robb, George, of Barscobe, breeder of Galloways, i, 67.
 Robertson, James, of Dublin, breeder of Dexters, i, 110.
Rob Roy, Clydesdale, iii, 4.
 Robson, Jacob, of Byrness, breeder of Cheviots, iv, 28.
 Robson, John, of Newton, breeder of Cheviots, iv, 28.
 Robson, Mr., of Belford, breeder of Cheviots, iv, 25, 28.
 Robson, S., of Derbyshire, breeder of Lincoln Reds, i, 119.
Rodney Stone, bulldog, vi, 108.
Roman Consul, Shorthorn bull, i, 148.
 Romney Marsh, ii, 6; iv, 201-3.
 Roscommon sheep, iv, 68-70.
Ros Water, Polo pony, iii, 74-5.
Rosie, Clydesdale, iii, 7.
 Ross, John, of Milleraig, feeder and exhibitor of fat cattle, ii, 156.
 Rot, in sheep, iv, 160-9.
 Rothschild, Lord, breeder of Shire horses, iii, 15.
 Rouen duck, v, 171.
 Roughs, breed of sheep, iv, 70-1.
 Round worms of intestines, causing scour, in lambs, iv, 178-9.
 Roup, in poultry, v, 255-7.
Royal Duke, Shorthorn bull, i, 146.
Rufus, Hackney, iii, 41.
Rufus, Hereford bull, i, 83.
 Runciman, Mr., President of Board of Agriculture, vi, 46.
 Rupture and twisted gut, in cattle, ii, 183.
Ruth, and descendants, Shorthorn cows, i, 146.
 Ryland sheep, iv, 71-3.
- ## S
- St. Columba*, Blackface ram, iv, 19.
 Sale, Mr., breeder of Longhorns, i, 123.
Sammy the Verger, Polo pony, iii, 75.
 Sampson's *Survey of Londonderry*, i, 104.
 Sanders, G. E., Scampton House, breeder of Lincoln Reds, i, 117, 119.
Sandway, Polo pony, iii, 75.
 Scab, in ferrets, vi, 167.
 Scabies, in pigs, v, 124-5.
 Scalds, in cattle, ii, 232-3.
 Scaly leg, in poultry, v, 267.
 Scaly skin, in cattle, ii, 219.
Scampton Exile, Lincoln Red bull, i, 119.
Scampton Gold Reef, Lincoln Red bull, i, 119.
 Scandinavian cattle and horses, i, 31-3, 134; ii, 1.
 Schmidt of Kölding, Danish veterinary surgeon, ii, 203.
 Scirrhous cord, in cattle, ii, 258.
 Score card, system of judging dairy cattle, i, 232-3, 252; specimen copy of, i, 234, 253.
 Scorer, Messrs. F. & C., of Nettleham, i, 117-8.
 Scotch-bred Shorthorns, i, 167, 198.
Scotch Grey fowl, v, 146-7.
Scotland Yet, Shorthorn bull, i, 147.
 Scott, R., of Drumhughra, breeder of Galloways, i, 67.
Scottish Archer, Shorthorn bull, i, 147.

- Scottish Milk Record Association, i, 236-240; ii, 31.
- Scour, in calves, ii, 180-1; infectious, in calves, ii, 181; white, in foals, iii, 242; in lambs, iv, 178; in pigs, v, 108-10.
- Scratching, in ferrets, vi, 167.
- Scudamore, Lord, originator of Herefords, i, 78.
- Secretary of State, Shorthorn bull, i, 147.
- Sedgemere Capella, goat, vi, 100.
- Sedgemere Cravate, goat, vi, 100.
- Selection, in breeding, i, 26-8; ii, 13-4.
- Sellar, Patrick, breeder of Cheviots, iv, 28.
- Sessions, Harold, breeder of asses, vi, 176.
- Seton needles, ii, 166.
- Setters, vi, 121-2.
- Sexton, Mr., breeder of pigs, v, 5, 25.
- Seymour, Mr., of Ballymore Castle, breeder of Aberdeen-Angus, i, 40.
- Sharpe's Practical Stud Groom, iii, 150.
- Shaw, Thomas, owner of Shire stallions, iii, 97, 100.
- Sheep, breeds of, iv, 13-96.
- Sheep, diseases of, iv, 159-252.
- Sheep, general management and feeding of Hill flocks, iv, 149-58; selection of tupps, iv, 150; lambing, iv, 150-1; tupping, iv, 151-2; hand feeding, iv, 152; shepherding, iv, 152-3; cost of herding, iv, 153; improving hill pasture, iv, 153-4; stocking, iv, 154-5; management, iv, 155-7; the hill shepherd, iv, 157-8; rent of hill farms, iv, 158.
- Sheep, general management and feeding of Lowland flocks, iv, 135-49; selection and breeding, iv, 135-6; selecting ewes, iv, 136-9; management of ewes, iv, 139-46; drafting and marking, iv, 146-9.
- Sheep-farming in the British Isles, iv, 1-13; origin, iv, 1-2; number and local distribution, iv, 2-8; imports of live sheep and mutton, iv, 9-10; wool imports, iv, 10-11; wool prices, iv, 11; wool washing, iv, 11; pedigree sheep, iv, 12-3.
- Sheep-farming, profitable, iv, 97-133; difficulties, iv, 97-9; benefit of sheep to the land, iv, 99-101; revenue from sheep, iv, 101-2; cost of raising and fattening tegs, iv, 102-9; importance of breed and class, iv, 110-4; market requirements, iv, 114-5; production of mutton, iv, 115-20; overstocking, iv, 121-2; fat lambs, iv, 122-3; raw breeding, iv, 123-5; production of wool, iv, 126-9; cross-breeding, iv, 130-3.
- Sheep Fly, iv, 199-200.
- Sheep Nasal Fly, iv, 190-2.
- Sheep pox, iv, 216-8.
- Sheep scab, iv, 192-7.
- Shennan, R. & J., of Balig, breeders of Galloways, i, 67.
- Shetland cattle, i, 133-9; appearance and origin, i, 133-4; improvement and spread of, i, 134-5; as milkers and beef cattle, i, 135; system of breeding and feeding, i, 136-7; crosses, i, 137; selling centres, i, 137; weights and prices, i, 138; scale of points, i, 138-9.
- Shetland ponies, iii, 77-9.
- Shire horses, iii, 11-9; origin, iii, 11-2; shows, iii, 12-3; points, iii, 13-4; best breeding districts, iii, 14-5; formation of studs, iii, 15; management, iii, 15-8; colour, iii, 18; prices, iii, 18-9.
- Shivering, in horses, iii, 172-5.
- Shoeing of horses and accompanying diseases, iii, 243-56.
- Shorthorn cattle, aggregate number, i, 57; origin, i, 139-40; the Collinga period, i, 140-2; the Booth and Bates period, i, 142-4; Scotch period, i, 144-55; first prize-winning sires, with pedigree notes, i, 148-55; as beef producers, i, 155-9, 242, 246; as milkers, i, 159-62, 225; ii, 27-9; description, i, 163-6; position at present day, i, 166-7.
- Shropshire sheep, iv, 73-6.
- Sidebone, in horses, iii, 179-83.
- Simpson, George, breeder of Jersey cattle, i, 96.
- Sinclair, Sir John, breeder of Cheviots, iv, 25, 28, 111.
- Sinclair's History of Shorthorn Cattle, i, 246.
- Sir Everard, Clydesdale, iii, 9-10.
- Sir Morell Mackenzie, Clydesdale, iii, 10.
- Sir Walter Scott, Clydesdale, iii, 4-5.
- Sittyton herd of Shorthorns, i, 144, 146, 148; ii, 57.

- Sleepy staggers, in cattle, ii, 215.
- Small White pig, v, 25-6.
- Smith, Mr., of Leaston, breeder of Cheviots, iv, 29.
- Smith, Mr., of Mowhaugh, breeder of Cheviots, iv, 28.
- Smith, Alfred, breeder of Red Polls, i, 129.
- Smith, Edward, Cowly, Keighley, breeder of Lonk sheep, iv, 64.
- Smith, Hamilton, writer on horses, vi, 173.
- Smith's Horse*, Suffolk, iii, 22.
- Society of Border Leicester Sheep Breeders and Flock Book, iv, 23.
- Soiling crops, ii, 109.
- Solferino*, Shorthorn bull, i, 148.
- Soluble carbohydrates, ii, 70, 79.
- Sore back, in horses, iii, 213.
- Sore chine, in horses, iii, 213.
- Sore feet, in cattle, ii, 250-1; in dogs, vi, 152.
- Sore shoulders, in horses, iii, 213.
- Sore teats, in pigs, v, 130-1.
- Sore throat, in cattle, ii, 235; in horses, iii, 203-5.
- South Devon cattle; aggregate number, i, 57; origin, i, 168; expansion of breed, i, 168-70; characteristics, i, 170-1; milking records, i, 171-2; bulls, i, 172; rearing and feeding, i, 173-4; crosses, i, 174; prices, i, 174-5; scale of points, i, 175.
- Southdown sheep, iv, 78-82.
- Southesk, Lord, breeder of Aberdeen-Angus, i, 35.
- Soya cake, ii, 150-2.
- Spaniels, vi, 122-4.
- Spanish fowl, v, 147.
- Spanish Hero*, Polo pony, iii, 74.
- Spavin, in horses, iii, 193-6.
- Spaying of calves, ii, 258-9; of pigs, v, 133-4.
- Specks on the eye, in cattle, ii, 210-1.
- Speedy cut, in horses, iii, 252.
- Speir, John, of Newton, breeder of Ayrshires, i, 45.
- Spicer, Mrs. Handley, breeder of goats, vi, 72, 92.
- Splint, in horses, iii, 189-93.
- Sproat, George G. B., breeder of belted Galloways, i, 67.
- Starch equivalents of feeding-stuffs, ii, 87-9.
- Starston Emperor*, Red Poll bull, i, 133.
- Stephens, H. C., Hampshire, breeder of Highland cattle, i, 93.
- Stephenson, Dr. Clement, breeder of Aberdeen-Angus, i, 40.
- Sterility, in cattle, ii, 193.
- Stevenson, William, writer on agriculture, iv, 38.
- Stewart, Donald, Archibald, and John, breeders of Highland cattle, i, 87.
- Stilgoe, Mr., breeder of Oxford Downs, iv, 64.
- Stomach staggers, or impaction of third stomach, in cattle, ii, 179-80.
- Straffan herd of Shorthorns, i, 147, 162.
- Straining, in sheep, iv, 235-7.
- Straker, J. C., breeder of goats, vi, 72, 91.
- Strangles, in horses, iii, 205-6.
- Stricture, in cattle, ii, 178.
- Stringhalt, in horses, iii, 175-7.
- Struck, in sheep, iv, 200-3.
- Sturdy, in sheep, iv, 186-90.
- Sudbourne Lassie*, Suffolk mare, iii, 93.
- Suffolk horses, iii, 20-8; description, iii, 20; origin, iii, 20-3; characteristics, iii, 23-7; trade in, iii, 27-8.
- Suffolk sheep, iv, 82-6.
- Sunstroke, or heat apoplexy, in cattle, ii, 217.
- Supplementary foods on grass, ii, 108-9.
- Supply or Loan Scheme, for improvement of cattle in Scotland, i, 219.
- Sussex cattle; aggregate number, i, 57; origin, i, 176-7; as beef cattle, i, 177-9, 249; exports, i, 180; home demand, i, 181.
- Sussex fowl, v, 163-4.
- Sway-back or swing-back, in sheep, iv, 242-4.
- Swine erysipelas, v, 103.
- Swine fever, v, 101-2.
- Swine plague, or hog cholera*, v, 102.
- Swinlees herd of Ayrshires, i, 44.

T

Tait, Mr., manager, Windsor Royal herd of Shorthorns, i, 146.
 Tamworth pig, v, 26-30.
 Tanquary, Mr., breeder of Shorthorns, i, 143.
 Tapeworm, in lambs, iv, 169-73.
 Tate's cube-sugar boxes for packing honey, vi, 14, 17.
 Taylor, G., of Cranford, breeder of Red Polls and Shorthorns, i, 131, 166, 225; ii, 29.
 Taylor, William, of Park Mains, breeder of horses, iii, 10.
 Teymouth fold of Highlanders, i, 87-8.
 Teats, difficulties with, in cattle, ii, 207-9.
 Tees Valley, cattle district, ii, 7.
 Teeswaters, old breed of cattle, i, 140, 246; ii, 3; iii, 5.
 Telegony, i, 12-3.
 Terriers, breeds of, vi, 124-32.
 Tetanus, in cattle, ii, 214-5; in sheep, iv, 246-8; in pigs, v, 117.
 Thornton, Colonel, breeder of Pointers, vi, 119.
 Thoroughbred horses, iii, 50-7.
 Thrush, in horses, iii, 218-9; or aphtha, in poultry, v, 261.
 Tichborne Park herd of Guernseys, i, 73.
 Ticks, in cattle, ii, 224; in sheep, iv, 197-8.
 Tillyfour breed of cattle, i, 36-9.
 Tintock, Clydesdale, iii, 6.
 Tollemache, Charles, breeder of Longhorns, i, 123.
 Toller's Matchet, Suffolk horse, iii, 23.
 Tomkins, family of, breeders of Herefords, i, 78, 197, 204; ii, 45.
 Top Gallant, Clydesdale, iii, 9.
 Torn eyelids, in cattle, ii, 209.
 Torr, Mr., of Aylesbury, breeder of Shorthorns, ii, 45.
 Toulouse, or Grey goose, v, 173.
 Tread, or tramp, in horses, iii, 253-4.
 Treadwell, Mr., breeder of Oxford Downs, iv, 64.

Tregonwell Frampton, Thoroughbred, iii, 54.
 Trethewey, Wm., Grampond Road, Cornwall, breeder of Shorthorns, i, 146.
 Trochar, surgical instrument, ii, 178.
 Trojan, Aberdeen-Angus bull, i, 38.
 Troubadour, Shorthorn bull, i, 148.
 Tuberculin testing, ii, 169-71.
 Tuberculosis, in cattle, ii, 168-71; in horses, iii, 201; in pigs, v, 105-6; in poultry, v, 267-8.
 Tuley, Joseph, breeder of pigs, v, 3, 16.
 Tull, Jethro, i, 241-2; ii, 126.
 Tulley, family of, breeder of Herefords, i, 78.
 Turkeys, breeds of, v, 174-5.
 Turnell, Thomas, of Reasby, breeder of Lincoln Reds, i, 115.
 Turner, A. P., of the Leen, breeder of Herefords, i, 82-3.
 Turner, G., of Thoverton, early breeder of Devon Long-woolled sheep, iv, 35.
 Turner, J. Sidney, breeder of Mastiffs, vi, 116.
 Turnips, introduction of for cattle improvement, i, 193, 242; ii, 126.
 "Turnip" Townshend, i, 242; ii, 126; iv, 6.
 Turnsick, in sheep, iv, 186-90.
 Tusser, Thomas, early writer on agriculture, v, 75.
Twopenny, Longhorn bull, ii, 52.
 Twort and Ingram, Messrs., ii, 182.
 Twyman, Mr., of Whitchurch, Hants, early breeder of Oxford Downs, iv, 64.
 Tympany, in cattle, ii, 178.

U

Unsound feet, in horses, iii, 186-9.
 Urinary organs, disease of, in sheep, iv, 250-1.
 Urination, excessive, in cattle, ii, 190.
 Urine, bloody, in cattle, ii, 190-1; retention of, in cattle, ii, 192; leaking of, in cattle, ii, 192.
 Utility Poultry Club, v, 156, 200, 230.

V

Vancouver, Charles, writer on agriculture, iv, 44.

W

- Wainman, W. B., breeder of pigs, v, 3, 16.
 Wakefield, Mr., cattle expert, i, 104, 107.
 Walker, Mr., of Portlethen, breeder of Aberdeen-Angus, i, 35.
 Wallace, Professor, writer on agriculture, i, 245; iv, 112.
Wanderer, Shorthorn bull, i, 148.
 Wantage, Lord, breeder of Shire horses, iii, 15.
 Warbles, in cattle, ii, 225.
 Warts, in cattle, ii, 221.
 Water in the chest, or chest founder, in cattle, ii, 241.
 Watson, Hugh, of Keillor, breeder of Aberdeen-Angus, i, 33-8, 40, 198.
 Weald of Kent, cattle grazing district, ii, 6.
 Webb, F. N., breeder of Southdowns, iv, 79.
 Webb, Jonas, breeder of Southdowns, iv, 79, 139.
 Webster, Mr., of Canley, breeder of Longhorns, i, 121.
Wedge, Suffolk horse, iii, 23.
 Weismann, author of *germ plasm theory* of heredity, i, 9.
 Welsh Black cattle: aggregate number, i, 57; description and origin, i, 182-3; distribution through Wales, i, 184; as milk and beef producers, i, 184-5, 242; neglect in development, i, 186; rearing and feeding of calves, i, 186-8; failure of crosses, i, 188-9; difficulty of access to markets, i, 189; prices, i, 190.
 Welsh Greys, breed of cattle, i, 189, 243.
 Welsh Mountain sheep, iv, 86-94.
 Welsh ponies and cobs, iii, 79-83.
 Welsh "Runts", i, 188, 243.
 Wensleydale sheep, iv, 95-6.
 Westcar, Mr., breeder of Herefords, i, 79.
 Weston, Sir Richard, introducer of turnips for cattle feeding, i, 242.
 Whippets, vi, 132-3.
 Whistling, in horses, iii, 168-72.
 Whitaker, Mr., of Greenholme, owner of *Dairy Shorthorns*, ii, 27.
White Heifer, Shorthorn, ii, 60.
 Whites, in cattle, ii, 200-1; in mares, iii, 237.
 Whitley, Messrs., breeders of South Devons, i, 171-2.
Wigmore Tansy, goat, vi, 99.
Wigmore Topsy, goat, vi, 91-2, 100.
 Wiley, Samuel, of Brandsby, breeder of Shorthorns, i, 141-2.
 Williams, J. G., of Tring, breeder of Lincoln Reds, i, 117, 119.
 Willis, J. Deane, of Bapton Manor, breeder of Shorthorns, i, 147.
 Willoughby de Eresby, Lord, breeder of Lincoln Reds, i, 115.
 Wilson, C. W., of Rigmaden, breeder of Harness ponies, iii, 65.
 Wilson, James, Tundergarth Mains, breeder of Galloways, i, 67.
 Wilson, John, of Pirriesmill, breeder of Shorthorns, i, 147.
 Wilson pony, i, 23.
Windsor Benedict, Lincoln Red bull, i, 117.
 Windsor Royal herd of Shorthorns, i, 146.
 Winter, Professor, writer on agriculture, i, 184, 189.
 Woburn experimental farm, ii, 96.
 Wolton, Mr., of Newbourn, breeder of Red Polls, i, 127.
 Wood, Edward, Kendal, breeder of Rough sheep, iv, 71.
 Wood, J., of Totnes, breeder of South Devons, i, 170, 174.
 Wood, Joseph, Bannisdale Head, breeder of Rough sheep, iv, 71.
 Woodiwiss, Samuel, breeder of goats, vi, 67-8, 72.
 Wool, production of, iv, 126-9.
 Worms, in horses, iii, 224-7; in poultry, v, 266; in dogs, vi, 154; in ferrets, vi, 167-8.
Worsthorne Wonder, Lonk ram, iv, 64.
 Wounds, in cattle, ii, 226-32; in horses, iii, 210-1; in dogs, vi, 155; in ferrets, vi, 167.

Wroth, J. S., of Combe, breeder of South
Devons, i, 172.
Wyandotte fowl, v, 157-9.

Y

Yarn, town of, i, 140.
Yellows, in cattle, ii, 188.
Yorkshire Coach Horses, iii, 29-37.
"Yorkshire crosses", breed of sheep, iv, 95.
Youatt's theory of production of Dexter
cattle, i, 105; observations on Welsh
Black cattle, i, 184-5, 189; description
of Teeswaters, i, 246; opinion of Devon
cattle as beef producers, i, 249; remarks
on Ryeland sheep, iv, 71-2.
Young, Arthur, first Secretary of the Board
of Agriculture, i, 104, 106-7, 115, 124;
iii, 21; iv, 78.
Young Blyth, Clydesdale, iii, 5.
Young Champion of Clyde, Clydesdale, iii,
5.
Young Glancar, Clydesdale, iii, 5.