DEPARTMENT OF AGRICULTURE

VICTORIA, AUSTRALIA

POULTRY FARMING

An Australorp Sire

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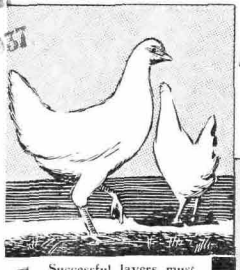

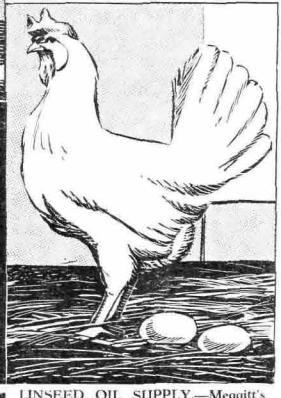

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DEPARTMENT OF AGRICULTURE

VICTORIA, AUSTRALIA

POULTRY FARMING

This Bulletin is in part a reprint of portion of Bulletin No. 54. Most of the remainder consists of articles contributed to the *Journal of the Department of Agriculture* by the Chief Poultry Expert and his staff. In reprinting these, some slight additions and alterations have been made.

The portions dealing with Bacillary white diarrhoea or Pullorum disease and Coccidiosis (pp. 150-158) were written by Harold E. Albiston, D.V.Sc., Veterinary Research Institute of the Melbourne University, for the *Journal of Agriculture*, and are now reprinted with Dr. Albiston's permission.

Section XXI.—Elementary Structure and Function of the Domestic Fowl—was originally delivered as a lecture by Mr. H. F. Clinton, Assistant Poultry Expert, Department of Agriculture.

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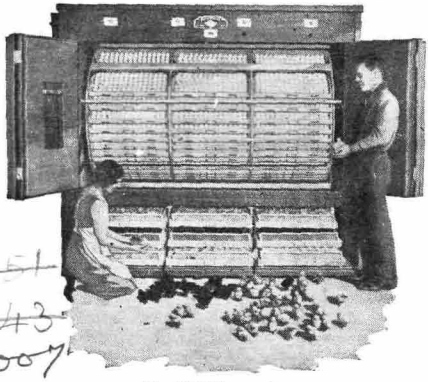

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CONTENTS—*continued.*

POULTRY FARMING.

I.—STARTING THE POULTRY FARM.

For those who have definitely decided to take up poultry farming as a living, answers must be given to the following questions:—

1. Where to start.
2. When to start.
3. How to start.

In considering "where to start," the questions of locality and soil must be borne in mind. While it is not suggested that any one locality is undoubtedly the best, it must be recognised that proximity to a railway station means reduced haulage of foodstuffs on the one hand, and in the marketing of produce on the other. The suitability of the climate must be considered. For instance, in the bulk of the northern parts of this State, i.e., the hotter districts, lack of ample water supply means an absence of green feed during the summer months, and green feed forms 50 per cent. of the birds' diet.

Sandy soil is the best for poultry, and heavy clay should be avoided. The advantages of sandy soil are several—

(*a*) being warmer, the chickens develop quicker with consequent saving of both food and time.
(*b*) a lighter, and so cheaper class of horse can be used for any cultivations that may be required
(*c*) On this class of soil the weather conditions can be almost entirely ignored, and the land worked any time of the year.
(*d*) With water and manure green crops can be grown all the year.

When to Start.

Egg production should always be looked upon as the main objective. The best prices for eggs are always obtained in the autumn and winter months, March, April, May, and June. Therefore, pullets should be hatched out so that they will be in full profit during that period. For the most successful results the breeding pens should be ready to hatch out chickens for winter laying, the exact dates depending upon the breed, the climatic conditions, and methods followed. The heavy breeds being slightly slower in reaching maturity should be hatched out two or three weeks earlier than the light breeds. July, August, and part of September will, in most places, be the best months for hatching. Too early hatching may mean a false moult when the colder weather sets in, although such birds may be safely used as breeders after being twelve months old, whereas the late-hatched bird is slower in reaching maturity, does not lay until the price of eggs begins to fall about mid-June, and never makes a satisfactory breeder.

How to Start.

It may be definitely stated that for successful poultry keeping the is no such thing as a "best" breed; if sufficient care and attention a paid to any breed it can be worked up to about the 300-egg mark.

Laying strain is far more important than breed, and the questi of "selection" will be discussed later.

There are virtually three ways of making a start.

1. Eggs.
2. Baby chicks.
3. One or more breeding pens.

Any of the foregoing methods will give good results provided th the buyer is prepared to ask for, pay for, and see that he gets—the be

Many of the prominent breeders issue catalogues of prices, and eg can be bought at almost all prices from 20s. each, down to about 4 each. These prices represent the seller's valuation of his own stoc Should the buyer, therefore, grumble if the birds from the 4d. eggs not give high records? The same reasoning applies to baby chick which can be bought from as low as 9d. or 1s. each *and upwards.* T beginner is urgently advised to get a few of the "upwards," in preferen to numbers of comparatively low-grade chicks.

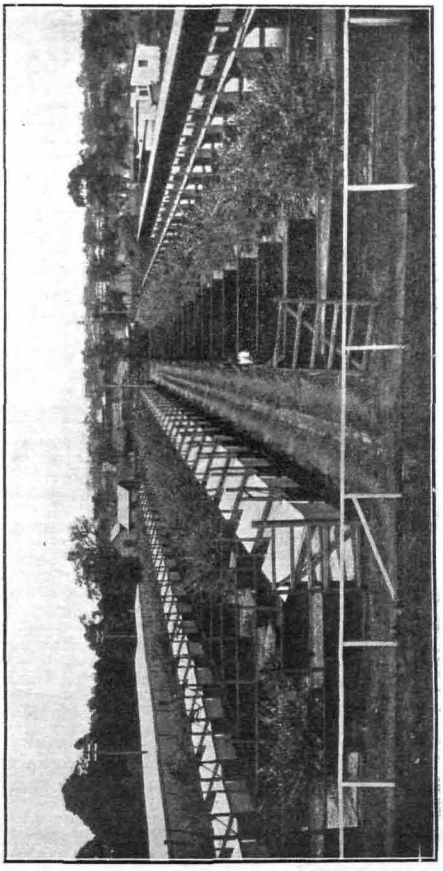
Equipment.

Maximum efficiency, within reasonable limits of expenditure, shou be the key to the design of any well laid-out and equipped poultry farr It is of considerable importance for the poultry farmer to decide at t start the extent to which he hopes or intends to develop ultimately, order that a sketch may be made of the plant at its full capacity an designs made of the shedding immediately required.

Letters are continually being received inquiring for plans of buil ings for poultry, but no standard design has been adopted by the D partment of Agriculture, for the reason that the materials available Victoria are so varying that no standard could be followed with ar faithfulness.

In planning out the accommodation, certain general principles mu be observed. Due regard for the ultimate extension must not overlooked, and labour-saving methods and appliances should adopted wherever practicable. For the poultry farmer on a big sca the laying down of a small trolley line of hardwood or iron rai will mean a saving of labour, and where there is an ample wat supply it is an economy to adopt the ball-cock system in each pe With guttering at normal prices, a tap may be used just dripping in the guttering which is carried past each pen, but provision should made for cutting out any pen where sickness may arise, so as to prever the water supply becoming a source of infection for the rest of the floc Plans should be made for the following sheds:—Feed store and mixir room, egg room, incubator shed, brooder shed, movable chicken color houses, breeding pens, single test and laying sheds.

The feed store should be made rat- and mouse-proof, and rather *the large side, so that when opportunities occur stocks may be purchase* on a bigger scale than just "hand-to-mouth."



Egg Laying Competition Pens at Burnley.

The egg room should be as airy and cool as possible and well pr tected from the north. Plenty of shelving should be provided.

The Incubator Shed.—The small style of incubator has now virtual had its day, and the mammoth type of machine is becoming more ar more popular; in fact, a big incubator represents a very sound inve ment for those in a position to purchase one.

The brooder shed should face north, and the other sheds in mo localities in Victoria should face east. The heating of the brooder sh may be supplied by hot-water pipes, gas, electricity, or kerosene lam

Portable colony houses for the growing chicks are really a necessit as it is a serious mistake to imagine that fowls can be reared year aft year in small back yards, as is at present, unfortunately, an all t prevalent belief. Sooner or later this practice will result in a mark depreciation in the constitutional vigour of the birds.

The breeding pens should allow 4½ to 5 square feet of floor spa per layer, and should be fitted with outside runs.

Single test pens may be built 5 feet deep by 3 feet frontage, t door forming the entire front. These sheds are useful for more reaso than merely enabling one to ascertain the exact number of eggs a bi lays in a given period. With them the shape and size of egg may al be ascertained, and the pens can be used for small special matings.

Laying Sheds.—These are to accommodate the bulk of the flock, co sequently all labour-saving devices should be carefully considere

On a properly managed poultry farm some system of bookkeeping essential. The simpler the system adopted the greater the likelihood the transactions being entered regularly and accurately. The princip expenditure is incurred in purchase of foodstuffs, and the main sour of revenue is from the sale of eggs. Accounts should be kept showir purchase of foodstuffs, materials bought for repairs and renewals (apa from new buildings, which are a charge on capital account and n current account), fuel or power used for heating incubators, brooder or working machinery, cartages and freights, advertising, labour, & and on the credit side the sale of eggs, market birds, stud sales, a manure. *The net profit is the surplus after all expenses have be paid, including interest on capital or on loans.*

In purchasing stud pens, it is again far better to start with a ve few "top-notchers" than to buy a lot merely because they are chea However, price alone may not in every case denote the actual qualit as at times breeders have various reasons for selling, or wishing to reta certain stock. There are a large number of thoroughly reliable breede most of whom are from time to time represented in public competitior so that the novice is not entirely dependent upon advertisement determine from whose stock to select.

Concerning Pedigrees.

Certain terms, used at times somewhat loosely, regarding pedigre are apt to confuse or mislead the novice. Eight or ten birds, of perha varying pedigrees, may be bred together with a certain cockerel. A the chickens from this mating are branded with the same toe punch. O pullet subsequently may be sent to a competition, and perform creditabl when all the others of the same punch are sold as brothers and sisters sometimes as full brothers and full sisters.

The use of the term "full brother" or "full sister" should be applicable only where the progeny are from the same individual mother as well as by the same father, failing which the term should be disallowed.

It is infinitely better for the beginner to start with half-a-dozen of the best than to commence breeding operations on a much larger scale with more or less moderate quality stock. An advantage in favour of buying stud stock in preference to eggs is that stud eggs may then be produced on the farm instead of being obtained by rail. Another point is that the stud birds may be used for several seasons.

A question frequently raised is "how many pullets can be raised per breeding hen?" The best way to arrive at an answer is to assume that 60—65 chicks will be hatched per 100 eggs set down, and after allowing for deaths, culls, and the fact that half the mob will be cockerels, the breeder should raise 25 pullets. In other words, he may count on getting one pullet for every four eggs set, and as the breeding hens will generally lay four eggs per week, one pullet per week per stud hen should prove a slightly conservative estimate. The age of the stud stock is of some importance. It is not desirable to breed from birds during their first laying season until they are fully matured, which is to say not until the birds are twelve months old, and then only provided that they possess sufficient stamina. Many a promising flock has been ruined by continued "pullet" breeding, with subsequent degeneration and loss of size and vigour. It is also preferable that the male bird be either a year older, or a year younger, than the hens he is mated with.

The beginner is also apt to make the mistake of buying a fresh cockerel every year from a different breeder "to get change of blood." Provided that he has received satisfaction in the first instance, he would be better advised to patronize the same breeder, as the breeder himself has to make certain changes in his matings, and so is in the best position to supply cockerels likely to suit stock supplied in previous years. The reliable stud breeders keep very careful records of their various blood lines, and so know what is most likely to suit their own stock.

Selection of Layers.

Whilst there is no definite method whereby it is possible to forecast the actual number of eggs any bird will lay in a given period, experience will undoubtedly enable the poultry breeder to select his best pullets for testing, and also his best hens for the breeding pens. It should be borne in mind that, while the egg-laying competitions have demonstrated and developed the remarkable fecundity of the various breeds, birds should never be mated on figures alone. The fact that a hen has tested up to, or beyond, the coveted 300 egg mark does not finally stamp her as a desirable breeder—she may be undersized or undesirable in some other way—and it is necessary that the weight limit be rigidly adhered to, to prevent deterioration.

Attention must also be paid to type, although the question of type admits discussion. The standards of perfection for most of the breeds were fixed years ago, when 200 eggs from a hen in a year were not looked for, and a total of 250 eggs was considered impossible. These standards were fixed by men interested in poultry from the exhibition point of view, the birds being given scant opportunity for demonstrating their laying abilities, being travelled from one show to another and

in the interim treated and fed for condition, plumage, &c. T
time has now come for carefully considered discussions
tween those interested in birds solely from the exhibition standpoi
and those equally interested from the purely egg-laying point of vie
In some cases concessions may have to be made by both sides. F
example, there are other points besides colour in the Rhode Island R
and because a bird has black feathers she is not necessarily
Australorp.

Activity in birds is always a good indication. Those first off
perch in the morning are the last to retire at night, and after foragi
and scratching about all day they go to roost with full crops.

During the past few years the practice of handling birds to det
mine the amount of abdominal development, quality of pelvic bon
&c., has become general throughout the State, and whilst this is
some value to the experienced breeder, it is to a certain extent
handicap to the novice, who may fail to make due allowance
condition as regards moult, or lay, and consequently reject a really gc
bird.

The following standard is recommended for selecting both layers a
breeders:—

GENERAL APPEARANCE.—Bright, active, and healthy. The first essen
a well-developed vigorous constitution, giving evidence
ability to transmit similar qualities.

HEAD.—Rather long in light breeds, and lean, narrowing somewhat
the back of the skull. Heavy breeds proportionately shor
in length of skull, but fractionally deeper.

EYES.—Full, round, prominent, and bright. Colour rich orange
except in the case of certain breeds, such as Australor
Minorcas, Langshans, &c., when the eyes should be such
dark brown as to appear black. The space from eye to nost
particularly in heavy birds, should be short, so as to prev
"shrunken face."

FACE.—The skin round the eye should be bright and clean and as f
as possible from face feathering.

COMB.—Thin, and fine in texture, thickening as little as possi
towards the base.

WATTLES.—Thin, and of the finest possible texture.

NECK.—Fine, and fairly long.

BODY.—Long, deep, and wedge-shaped, as is required in a good mi
cow; wide across the saddle.

BREAST BONE.—Straight and fine.

PELVIC BONES.—Thin, pliable, fairly long, and straight, set at consid
able distance from point of breast bone.

SKIN.—Texture of skin of abdomen to be of thinnest and finest quali
very elastic when in full lay.

LEGS.—Bayonet-shaped bone, not high, and set very wide apart.

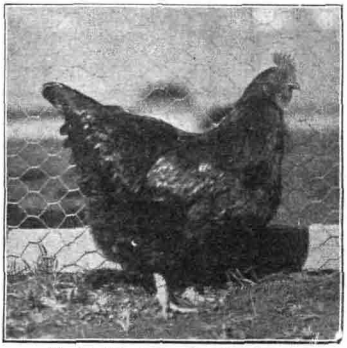
TAIL.—Full and flowing, not set at too high an angle, with long sic
and hackle feathers.

FEATHERS.—Profuse, but close and flat on the bird.

WEIGHT.—Six months pullets, White Leghorns, 3½ to 4 lbs.; 6 mon
pullets, Australorps, 5½ lbs.; and others in proportion.

To condense the foregoing points it may be stated that the bird should appear bright and alert, show strong constitution with a deep body and well-sprung ribs, flat bone in the leg, fine texture in comb and wattles; she should be tight in feather, and last, but by no means least, should have round, bright, prominent eyes.

The method of moult is instructive. Most of the best layers will moult slowly, feather by feather, the new feathers working through the old, the bird thus maintaining her lay throughout. For two reasons the full-moult bird cannot be expected to lay during the moulting season. One is that a greatly increased quantity of the food consumed is required to maintain the body temperature through lack of feathers, and the other reason is the drain on the system to renew the entire feather supply all at the one time. Consequently in a flock the bare



The Ideal Australorp Breeding Female.

red-headed birds that moult late and slowly should always be distinctively leg-banded. They are invariably hard in feather, and may retain one or two of the wing-flight feathers for a long time. The necessity for space from the breast bone to the pelvic bones in full lay is to denote abdominal capacity. If this capacity is lacking there is not room for a number of yolks to be developing at the same time to maintain an almost daily output of eggs. Crooked breast bones usually denote constitutional weakness, and any bird with such a defect should be discarded, unless the breeder is quite confident that the dent is the result of the bird's perching when too young. The foregoing hints for selecting good layers and breeders of layers apply to all breeds, and the general public should bear in mind that the question of breed is, after all, of far less importance than laying strain.

It so happens that great attention has been paid to White Leghorns, and more recently to Australorps, *but the breed is not the whole*

reason for the high scores these varieties have made in competiti
Certainly six White Leghorn pullets have yielded 1,699 eggs in one
at a Burnley competition, and an Australorp pullet has laid 338
in the same period, but if breeders will pay as much attention to car
selection in other light or heavy breeds, there is no real reason
the records of the White Leghorns and the Australorps sh
not be equalled or excelled. The ability to lay large numbers of
is not confined to two breeds, and that is why the Department of A
culture offers inducements at the competitions in the shape of a
tional sections to encourage the development of the laying capabili
in other strains. At an unofficial competition a Buff Orpington
laid over 300, and a Faverolle 298 eggs.

Selection of Breeding Stock.

The selection of breeding stock for the coming season, and the ma
of them, is one of the most interesting undertakings of the year.
success of the whole season depends on the judgment displayed
placing the right birds together.

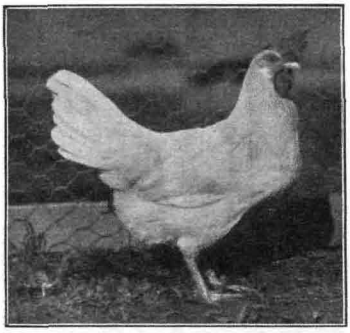
Many people assert that birds for egg-production can be picked
certain visible characteristics such as a certain type, measurement
certain bones, bold round eye, clean face, tight feather, &c. H
ever, after a good many years of experience I am compelled to say
I believe high egg-producers know no set type by which we can
them with certainty. I have had under observation hundreds of b
in both trap-nests and single pens, and it is surprising the numbe
hens, possessing many of the outward characteristics generally
sidered necessary to a good layer, which fail to lay even a fair num
of eggs. This can sometimes be accounted for by the fact that perh
the bird's digestive organs are not quite right, or she may not h
been fed the right kind of food to enable her to lay a lot of e
But there is another reason

It is essential for the breeder to bear in mind that the var
characteristics of the chicken may be inherited separately. It is poss
for a pullet to inherit many of the characteristics of a good layer
yet not inherit the factor for high egg production. It is there
plain that the first essential is the selection of birds that have the cl
acters wanted, and the next thing is to test their power to trans
those characters.

My experience is that certain birds are excellent in breeding
characteristic but fail in others. We have hens that transmit sev
desirable characteristics, but also transmit one or more very unde
able ones. One hen at Werribee which has almost all the outw
features that we look for in a good layer was tested as a pullet,
she produced 272 eggs and never went broody. When mated the
lowing year to a very fine cock she produced several daughters, s
of them much better layers than herself. One laid a sequence of
eggs, missed a day and laid another 45, and then went broody. Oth
however, were indifferent layers and laid small eggs. We could
account for it on the male side. For this cock was bred from a
that laid a good 2oz. egg, and his sisters laid big eggs, in fact one sis
was the mother of Mr. Cullen's hen that laid 338 at the 1923-24 Burn

Competition, a bird that laid a splendid egg. I weighed her 338th egg on the last day of the test and it weighed 2 7-16th ounces. Our experience is that there is a great difference among birds in their ability to transmit certain characteristics. Some birds are good breeders, others though closely related are of very little account. So the most progressive method of breeding is to know the parentage of each chicken. This will enable one, by testing the progeny of the matings, to find out the good qualities that have been transmitted; also it will point the way as to what steps should be taken to correct any undesirable qualities that appear.

I think there are too many men who value trap-nesting or single pens simply as a means of telling how many eggs hens lay in a given time. With most, if a hen lays a large number of eggs, that is sufficient to ensure her a place in the breeding pen, irrespective of her size and type, or the size of the egg she lays. Now, I maintain that

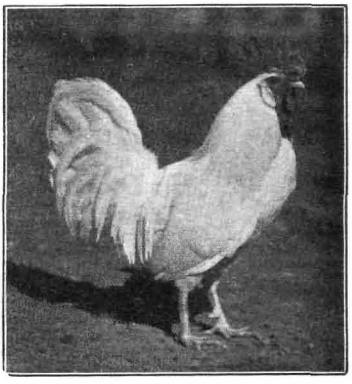


Good Specimen—Leghorn Female.

the greatest value in single-testing lies in the fact that it enables us to determine family traits in our birds, which is really the breeders' safest guide. For instance, if a pullet lays 300 eggs in a year and several of her sisters are poor layers, apart from the extra value of the eggs laid by her, she has no value as a breeder. But if there are four or five sisters that lay an average of 250 or over, it goes to prove that high egg-production is a family trait and likely to be transmissible, and any of these sisters is, in my opinion, of greater value as a breeder than the hen that lays 300 eggs, if she is the only high-producing member of her family.

It is now an accepted fact that high egg production is transmitted from the mother through her son to his daughters. Dr. Raymond Pearl, late of Maine, United States America, goes so far as to say that as long as the male carries the fecund quality in a high degree,

it is of much less importance that the females with which he is ma
be high producers, and that better results in this respect are obtair
with a good male and poor laying females than where the h
have big records and the male does not carry the fecund quality. T
has been corroborated to a certain extent by experiment at Werrib
A cockerel, bred from a hen that laid 110, and whose father was b
from a hen that laid 93, was mated to two hens, mother and daught
whose scores were 269 and 273 respectively. Pullets from these w
tested and turned out poor layers; ten averaged 153 eggs a bird. A
other cock (bred from a 272 hen by a cock whose mother laid 2
was mated to six very poor layers bought out of the Burnley E
Competition: their scores were, 7, 57, 96, 109, 130, 159. Thirt
pullets bred from these laid 2,396 eggs, or an average of a little o
184 eggs per bird. Four daughters of the hen that laid 96 all laid o



A Typical Utility Leghorn Sire.

200 eggs each This should be sufficient to show the great influence
male bird has in breeding for egg production, and how necessary
is to use only male birds bred from a family of high producers rat
than those from a hen which, though she herself may have laid a la
number of eggs, comes of a family of moderate layers. No poultry-farn
should be in a hurry to discard a good cock bird. Many a third a
even fourth season male will sire strong, vigorous progeny if he
been well cared for. Once a male proves his abilty to sire g
layers he is almost invaluable. The late Mr. Hart used to say that
was a comparatively easy matter to get hens to lay a lot of eggs, l
that it was a very difficult matter to find a mating which would prod
fast layers, and that once such a mating had been found it was wise
continue to breed within those lines of blood as long as possible.

In the selection of breeders for the forthcoming season, a bird's toe-mark is of far more importance than its looks, and if one knows the breeding behind a bird, he should think twice before he discards her because she fails in appearance. The toe-mark, together with the pedigree book, should give an owner a complete knowledge of the blood lines; this, in conjunction with the egg-record book, will give all the particulars required to enable one to make matings with the best prospects of success. It must always be remembered that the first selection of breeding stock should be on the basis of constitutional vigour and vitality. Therefore, unless a bird is typical of its breed, strong, and robust, and has gone through its life without sickness of any kind, she should be got rid of. A pedigree male is the only safe one to use, and it is not only necessary to know how many eggs his mother laid, but what sized eggs they were. Further, it does not matter how many eggs his mother laid; if he is not a bird of strong, vigorous constitution, it is very unlikely that he will transmit the good laying qualities of his mother to his daughter.

In stating a few of the principal features to be sought for in selecting a breeder let me say—first of all, I want to see the bird on the ground in a natural position, so that I can see whether it has a good outline for its breed and is of correct size. I like a bird to be alert and active, close in feather, with legs fairly wide apart and toes well spread, the bone of the leg flat rather than round. Next, I consider the head is the best index as to quality; it should be of good shape, with skull well defined; a good full round eye, prominent and well up to the top of the head, and the face clean and beak strong and nicely curved. If these qualities are there I then want to handle the bird, and it must have plenty of width across the back, and the body should be deep. This is the part of the body in which all the hen's chief organs operate—heart, lungs, and digestive organs—and it must be roomy if the hen is to develop speed as a layer. She must also possess depth of rib, and be flat-sided rather than round-bodied. There should be a good width from the point of the breast bone to the pelvic bones, and the end of the breast bone should have a downward tendency rather than upward. I like the pelvic bones to be straight, pliable, and free from flesh. All these points are desirable, but, as a combination, are hard to find in individual birds, and the best we can do is to get as many of these desirable qualities in a hen as possible and try to select a male bird strong in the qualities in which the hen is weak.

A breeder should never lose sight of the fact that every desirable quality in a strain can be fixed only by repeated and continuous selection year after year.

The Small Egg—a Danger to the Industry.

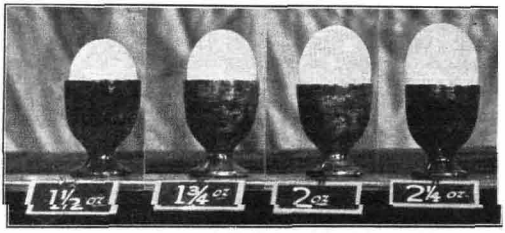
Perhaps the greatest danger to-day to the poultry industry in Victoria is the small egg. Victoria leads all the other States in the value of her poultry products, and the reason is that we have probably the best climate in the world for the production of every class of food necessary for the best development of all kinds of poultry, and we have poultrymen second to none in their knowledge of breeding and

management. For these reasons, the poultry industry is growing fast, and the export trade will have to be still further exploited. T is a huge market on the other side of the world, but unless we export the right size of egg, we will never be able to take full advan of that market.

It is a more serious matter than many people think. This ba the progress of the industry confronts me everywhere I go throug the State, and the pity of it is, many poultrymen do not or will realize the danger. It could be easily stamped out if poultrymen w only take a firm stand and refuse to incubate an egg that does weigh 2 oz., and also never place at the head of their breeding male birds whose mothers did not lay a 2-oz. egg.

Selection for Competition.

When selecting pullets to compete at the various competiti breeders should bear in mind that visitors to these competitions throu out the year are apt to judge the birds they see as representative b of the flocks from which they have been chosen. Competitors, theref should take every care to see that only birds of the very best qua are selected.



Which Looks the Best?

In most cases these birds will be wanted for breeding pens, especia those that have made high scores. As there is always a good dema for stud birds bred from good performers, breeders should give t matter serious consideration, as unless particular attention is paid size, type and constitution, no one can hope to breed good stro chickens from which to build up even a profitable flock, let alone reputation for himself and the State. High records are desirable, i type and constitution are absolutely essential to the poultryman w wants to make a success of his business.

The late Mr. Lewis Wright stated that "Every desired qual which has become characteristic of a strain is the result of repeat and continuous selection year after year." This is equally true whetl it is a particular colour of feather or the quality of high egg p duction.

So a poultryman, in making his selection for competition, should pay great attention to the breeding that is behind his birds; and, in my opinion, the pullets' toe-marks should be his surest guide, but it does not matter how many high records appear in their pedigree, unless they have stamina they cannot be expected to stand the strain of twelve months' heavy laying.

There are certain outward features apparent in nearly all birds capable of laying a large number of eggs if given suitable food and environment, and if kept in perfect health

It is my opinion that a bird's head is the most reliable guide as to its ability to lay well, for I have never seen a pullet with a bad head prove to be a good layer, though I have seen pullets with good heads fail to make high scores, but in most cases this has been due to some internal trouble or improper feeding.

A pullet's eye should be round, full, and bright, with as large a pupil as possible. It is from this source that the quickness of eye is derived enabling the bird to procure a large amount of food which a bird with a dull, sleepy eye would not see. The eye should project well out from the skull. The skull should be narrow and project well down the neck. The beak should be stout and not too long. The comb and wattles should be fine in texture and feel like silk. The ear lobe should be even in shape and of good texture. The neck should be thin and medium in length. The back should be as long and broad as possible, and wide across the wings. The breast should be well defined and show good crop capacity. The feathers should be close as possible. The legs should be flat boned, not too fine, but smoothly scaled; (a poor quality bone is round, hard, and roughly scaled); they should be straight and placed well apart, and the toes should be straight and well spread. When handled the abdomen should be wide, the skin soft, pliable, and elastic—it should not have a tough, hard or leathery feel. The quality of skin is closely related to the skin about the face of a bird. If the skin of the face is coarse, it is found to carry throughout and is a sure sign of lack of quality. The breast bone should be short and straight, and the end should have a downward tendency rather than upward; in Leghorns we find about 3¾ to 4 inches in the best layers. The pelvic bones should be thin and straight, and free from flesh. The most important thing about a layer's body is the distance from the point of the breast bone to the pelvic bones. The measurement of a good layer in the light breeds should be 3 to 3½ inches, and in the heavy breeds 4 inches and upwards Without this capacity it is impossible for birds to produce eggs in sequences, no matter how well bred they are or what amount of food is given.

It is hard to understand why some men send immature pullets to the competitions, as they must know that they will be greatly handicapped, for if they do not get off in the first week or ten days they have little chance of winning. On the other hand, it is unwise to send birds that have been laying for some time, as they are very likely to resent the excitement of being transferred from home to new quarters, with perhaps change of food, and may promptly go into moult.

Managers of competitions come in for a good deal of criticism each year, and are often blamed because birds stop laying on arrival at

the pens and moult. I think a good deal of this could be avoide the owners exercised a little more care in feeding just before the petition, and in crating their birds. If pullets are well grown and on the point of laying, their food should be of the plainest descripti The mash should be only plain bran and pollard and green-stuff, green-stuff at mid-day.

The grain ration should be mostly oats, say three parts oats and part wheat. Birds fed in this way are more likely to respond qui to the competition feed and get into their stride almost at once. the other hand, if pullets are backward, it is a good plan to feed n mixed with milk feed, with green-stuff at mid-day. The grain sh be before them in hoppers from mid-day to roosting time so that bird can get all it requires. If this is done, I consider it essential these birds should be fed fresh cut green-stuff the last thing, and hoppers closed till noon next day. This is a better plan than for birds with green bone or condiments as is frequently done. It is unwise to feed birds any food that they will not get at the competit The feeding of fresh cut green-stuff the last thing at night is a v derful aid to these young, growing pullets, as it helps to put t digestive organs into that perfect condition so necessary to pullets pected to lay a large number of eggs.

It is unwise to include in a team even one bird which has b sick at any time during her life, as, although apparently recovered twelve months' severe laying test is sure to find a weak spot, especi in a team test at Burnley. One ailing bird will handicap the wh team, therefore, poultrymen should be careful not to send a bird v any symptoms of contagious disease or even a slight cold.

The Crating of Birds for Competition.

It is hard to understand why some breeders go to no end of trou to hatch and rear birds for competition, take every care in bring them up to concert pitch, and then spoil it all by the want of a li thought in crating. It should be remembered that nearly all well-b birds are of a nervous temperament and highly strung. They sho be in tip-top condition, and be the very choicest of the flock. Th performances at the competition may mean the owner's success failure in the coming season. In view of this, surely they are wo a good comfortable crate so as to ensure their landing at the co petition ground in good order, even if the distance is only a short o

Many birds are sent in crates far too small, in which they beco cramped and overheated; this, with the added excitement, of causes colds to develop—sometimes a false moult—and their cha is thereby ruined from the start.

Treatment of Breeding Stock.

A number of poultry breeders complain each year of infertil amongst their breeding stock, and also, that often their best lay do not come into lay until late in the season, with the result that t chickens hatched are slow to mature, and often of quality inferior the parent stock. Much of this trouble would be avoided if poult men gave their breeding stock a little attention at the right time the year and prepared them for the coming season A great ma cases come under notice where, owing to the breeders' wish to ha

early chickens, they breed from pullets (many of them immature), because the older hens are kept laying right up to to breeding season, and just when their eggs are wanted for incubation these hens are moulting and resting.

There is no doubt that it is breeding from this immature stock that is the cause of so many small under-weight eggs coming on to the market. This is a much more serious matter than many poultrymen think, and unless they alter their methods it will mean ruination to themselves and a serious set-back to the poultry industry of Victoria.

It is absolutely necessary that breeders should at once realize the advisability of giving more attention to the breeding stock that is to produce the birds whose eggs will enable us to compete successfully in the egg markets on the other side of the world. In my travels through the State I meet far too many men who are sacrificing the constitution and stamina of their birds for high single test records, which are often obtained under artificial conditions of feeding and housing. The general result of using these coddled hens as breeders is stock of poor constitution.

If we consider the life of some of these hens such a result is not to be wondered at. In the first place the chicken is hatched under artificial conditions, and confined with an artificial mother till six or eight weeks old. She is then too often placed with a crowd of others in a shed, or sometimes a small run, with little grass and small range, and when about five months old put into a single pen, to be under control for twelve months, in order that her record may be ascertained. When she moults—very often still under cover—she is mated probably to a cockerel that has been hatched, brooded, and reared under the *same conditions.*

In my opinion it is impossible to keep up the stamina of our birds if we continue to breed under these conditions. Do what you like with those intended for layers—put them in sheds and get them to lay all the eggs they will; but where birds are wanted for breeding purposes, let them be reared under natural conditions: give them as much free range as possible, and feed them on only plain wholesome meals, succulent greenstuff, and clean grain.

Though the breeding season starts in July, the preparation of the stock should begin in March. All the birds likely to be wanted in the breeding pens should be selected in this month, and they should be placed in pens away from the laying flock. Their diet should be of the plainest description, very little mash, but plenty of succulent green-stuff, and the grain ration should largely consist of plump Algerian oats. The object is to get these ens to rest, and to encourage them to moult by feeding a little sulphur or boiled linseed in the mash occasionally. This will help them to grow a new set of feathers, and then they will be ready to lay by the time the eggs are wanted for early hatching operations.

The selection of breeding stock should be on the basis of vitality and constitutional vigour. If selection be made on records alone, and only the highest producers used as breeders, without due consideration being given to the birds, size, type, and constitution, the stock will deteriorate. If birds are selected without these qualities they will not reproduce stock with the health and perfect digestive organs so

necessary to the pullets which are expected to lay large number eggs.

I would strongly advise poultrymen never to place at the head their breeding pen a male bird the mother of which laid eggs of than two ounces, and never to incubate an egg that does not w two ounces. This is, I am sure, the only way by which the size eggs laid by a flock will be increased.

A very important thing to remember is that the best and stron chickens are hatched from the first twenty or thirty eggs that a lays after her moult.

II.—INCUBATION OF EGGS.

There are virtually three methods by which hatching may be effec *i.e.*—(1) Natural Method; (2) Semi-Natural Method; (3) Artifi Methods.

The first method—Natural Hatching—is when a hen steals her n and hatches out her own eggs, almost invariably with the utmost succ whereas in the second (semi-natural) method the hen is set, w broody, on eggs not necessarily laid by herself, and in a place chosen man. The nest should be made in a place apart from the general flo and the sitting hen should be given plenty of fresh, cool, drink water (as broodiness is a feverish condition) and provided with a g dust bath to keep herself clean from vermin, which, if undestroy would materially retard the growth and welfare of the chickens w hatched.

It is desirable to keep a record of each hen to show such data as, w set, date hatch is due, number of eggs set, number fertile, and result hatch; also the pen number from which the eggs came. The first t should be made between the fifth and seventh days, when the emb may be readily detected, and the commencement of the blood ve system is also noticeable. By setting, if possible, three hens at once is generally easy to re-group the fertile eggs, and so enable one of hens to start off again on a fresh lot of eggs.

The second test may be made between the twelfth and fourtee days, when the bulk of the eggs appears dark and the air space of egg—about one-fifth—is plainly visible. The hen must not be disturl after the nineteenth day, and hatching should be completed by twenty-first day. The reason why better results may be expected fr the purely natural method is because the hen has mated with the roos when in the best condition for breeding, and also because in choos nest and conditions she is frequently a better judge than man.

There are now two main systems of incubation—(*a*) hot wa or tank machine type; and (*b*) hot air machine. In the l water type, the heat is supplied by radiation from the bottom of copper tank containing water heated by kerosene or gas. In the l air type, the heat supplied is a downward current of hot air, genera obtained from kerosene or gas. Preference for any one type is a mat for the individual operator, who had always better be master of type than the slave of several; yet, far too many breeders have motley collection of all types and sizes.

In warmer latitudes the objection to the tank machine is that it cannot be easily cooled during the day time in a warm spell, nor quickly heated on a cold night. For this reason, north of the Dividing Range, the hot air type is generally preferred, though in the Gippsland and Western Districts, with their cooler climates, the tank machine is excellent.

There is little doubt that the mammoth type of incubator will gradually supersede the small machines, on account of the greatly reduced cost of working.

Development of the Embryo.

During the first day there are two growth centres, the head process and the primitive streak, the latter appearing in the blastoderm in the axial line of the future embryo, but somewhat behind the place where the embryo proper begins to develop. In the head process there is the first development of the spinal nerve, as well as a rod of cells termed the notochord, which forms the supporting and stiffening axis of the body, and there is a thin membrane termed the amnion (or caul), which forms a closed sac surrounding the embryo.

The second day the head continues to develop rapidly, and the formation of blood vessels begins, the heart being formed within the head fold, with vitelline veins and vitelline arteries. Two swellings from the brain form the first trace of the optic system, and the ears are represented by two slight depressions where the hind brain will ultimately develop.

The third day marks the commencement of the internal organs, with a considerable reduction of the white of the egg, caused by the increased activity of the blood-vessel system.

The fourth day the white, or albumen, of the egg is further reduced, the wings and legs appear as conical buds, the kidney is also developed, and the amnion is fully formed and completely surrounds the embryo. By the fifth day the legs and wings have increased in length, although they are still very much alike.

The sixth day the avian characteristics have developed in the legs and wings, head and alimentary canal. Hitherto there has been little distinction from the embryo of mammals or reptiles.

The seventh day the head ceases to grow more rapidly than the body, and motion becomes apparent. Feathers begin to appear on the ninth day, but do not protrude until the thirteenth day.

The beak appears on the eighth day, and by the sixteenth day the beak and nails have hardened. By the fourteenth day the chicken changes its position from lying at right angles to the axis of the egg, and thereafter lies lengthways. By the twentieth day it pierces the inner shell membrane, and commences to breathe, consequently the allantois circulation gives way to that of the lungs. The twenty-first day the chicken hatches, prior to which the remainder of the yolk is absorbed, providing sufficient nourishment for about 24 hours or so.

Number of Pullets to be expected from a hatch.

Incubation is one of the most interesting, and also one of the most important operations in connexion with poultry-keeping. The poultryman depends chiefly upon the pullets for the supply of eggs during the winter months; it is, therefore, advisable for him to replace a large proportion of the laying flock each year with pullets. This replacement

makes the use of artificial methods of incubation absolutely ess
On most commercial farms it is estimated that for every six eg
by the breeding stock only one pullet is reared. Wastage takes p
the following way:—For every six eggs gathered, one is discar
account of size, shape, or shell texture. Later it is proved th
of the eggs is infertile and another is of weak germ, and the c
dies in the shell; thus from the five eggs placed in the machine,
chicks are hatched. From these chicks, after allowing for los
death, accident, and culling, also 50 per cent. cockerels, on the a
slightly more than one pullet reaches maturity, the proportion
about 25 per cent. of the eggs actually set down. This shows th
replacement cost is very heavy; consequently it is necessary to
to every detail that is likely to affect it in any way.

Hatching chicks successfully in an incubator depends on a n
of circumstances, quite apart from the actual operating of the ma
Some of the factors which influence the hatch are:—The vigour
breeding stock, their care and management, selection of hatching
storage of hatching eggs, time when eggs are set, and incubator m
ment.

The careful selection of the birds intended for breeding will elir
many poor layers and weak individuals. The selection should
place several months before the breeding season commences. Th
give the poultry-keeper an opportunity to prepare the birds f
breeding season. Early moulters are looked upon with suspicion
moulters are usually the most desirable birds from which to bree
the selected birds continue to lay into April, production sho
stopped (*see* page 21), so that they may be laying again when the
breeding season commences. During the moult, the birds' reprod
organs have a complete rest, so the first 20 or 30 eggs laid aft
moult are the ones most likely to hatch good strong chicks. Onl
one year old or over should be used for breeding. Breeding
immature pullets will usually result in weak chicks and smaller
It is very important to know how the male bird is bred, and he
be well developed with plenty of constitutional vigour.

Breeding stock should have been well fed during the winter
general, the ration which is recommended for layers is satisfacto
breeders. Ample supplies of good succulent green feed shou
supplied, and, if possible, skim milk or dried butter-milk. The f
of milk and greenstuff is known to have a good effect on the
themselves and on their eggs. The ideal breeding pen is one where
birds are allowed free range. If they must be housed, they shou
allowed as much room as possible, and be supplied with plenty of
scratching material to provide exercise. The house should be s
structed that the direct rays of the sun can shine on the birds.
sunlight on breeding stock has a beneficial effect upon fertilit
hatchibility of eggs.

The number of hens that should be mated to each male bird
with the different breeds, and is also dependent on the varying
tions under which birds are kept. The more freedom they ha
greater the number of hens that can be mated to each male.
White Leghorns, twelve to fourteen hens can be mated to one male
Australorps, Rhode Island Reds, and Light Sussex, from eight to t

The Selection of Eggs for Hatching.

Eggs suitable for hatching should be selected from those gathered each day. The hatching of many crippled, deformed, and "dead-in-the-shell" chicks could be prevented if only normal-sized, good-shelled, and good-shaped eggs were set. The ideal hatching egg should weigh not less than 2 ounces, and have a smooth shell of medium thickness, and be free from ridges or roughness. Thin-shelled eggs dry out rapidly, and thick-shelled eggs do not permit good circulation. Those of normal shape are desirable. There is no foundation for the ancient idea that long eggs will hatch cockerels, and short round eggs hatch pullets. In fact, there is no way to predict the sex of the chick from observation of the egg. On the average, half the eggs will hatch cockerels and half pullets.

Eggs of stud stock should be gathered frequently, especially in bad weather. Frequent gathering will prevent the necessity for cleaning the eggs, which takes a great deal of time, and may affect incubation. Very dirty eggs should be cleaned before being placed in the machine; but it is preferable to have the eggs taken while clean from the nest.

Eggs that are being held for incubation should be stored in a cool, well-ventilated room. Scientists tell us that incubation commences, or at any rate that change will begin to take place, in an egg at a temperature as low as 68° F. It is probable that eggs are not injured for hatching purposes if they are stored where the temperature does not go below 40° F. A temperature of between 55° and 65° should be ideal. The length of time that eggs may be held and still hatch reasonably well is debatable, but there is no doubt that the fresher they are the better. It is advisable to use eggs not more than about 7 days old.

Early Hatching recommended.

The result of years of experience on the Research Farm, Werribee, has shown the advisableness of hatching early. There are many advantages gained by doing so. Surplus cockerels may be sold on a higher market. Pullets develop well in the early spring, and are better able to withstand extreme heat in the summer; they also mature quickly and begin to lay when egg prices are improving. Late-hatched chicks are hard to rear; they are slow in maturing, and the pullets do not begin to lay until late in the winter when egg prices are declining. While some early-hatched pullets have a tendency to go into a false moult in the early winter, they more than make up for the short time lost by an increased number of eggs in the late summer and autumn. This false moult does not usually affect the entire flock, and experiments have shown that it can be checked by feeding a large proportion of grain, or by allowing free choice of grains during the autumn and early winter.

The months most suitable for hatching are July, August, and September. At the Research Farm, no chicks are hatched after 30th September.

Operating the Incubator.

Before the hatching season starts, the incubator should be examined, and any missing or broken parts replaced. The heater must be free from soot or dust. The lamp should be thoroughly cleaned, and the

burner boiled in soap-suds to remove any oil or carbon. A new should be obtained at the beginning of the season, and be of such qu that it will not require replacement during the season. The ma should then be connected and made perfectly level, and given a run to see that all the parts are in working order.

The instructions supplied by the maker of the machine shoul studied carefully, and at least followed fairly closely. Condition course, vary in different districts and in different rooms; there regulations cannot always be rigidly observed, and they must be v to meet circumstances. To operate an incubator successfully, one sh keep in mind three essentials: heat, fresh air, moisture. The development of the chick-embryo takes place when these are prese proper proportions.

The experience of most operators is that the correct temperatur incubating hen eggs is from 103° to 104.5°. The temperature sh always be read with the bulb of the thermometer just 2 inches a the tray on which the eggs are placed—that is, just a little above th of the eggs. As the temperature varies at different levels in the chamber, it is most important that the readings be made at a con level. The further away from the source of heat, the lower the tem ture, and vice versa. At the commencement of the season, thermometer should be tested by a chemist, or one may do it onesel comparing it with a clinical thermometer. If it is not registe correctly, allowance can be made accordingly. Good results are us obtained when the machine is operated at 103° for the first week, for the second, and 104.5° the third week. To maintain an even tem ture, the machine should be operated in a room which is not aff greatly by outside temperature. Care should be taken that the sun not shine directly on the machine, and thus raise the temperature.

Like any other growing thing, the chick-embyro needs oxy which it obtains from fresh air. To ensure a regular supply of f air in the machine, the incubator room, as well as the machine i must be well ventilated. An incubator room built on the ground is preferred to a cellar, because it is much easier to ventilate. M instances have been brought under notice where bad ventilation been the direct cause of poor hatches—the chicks dying in the s Often, in the endeavour to keep the incubator room at an even tem ture, the ventilators are closed, but probably the lack of fresh air more harm than a slight variation in temperature.

Incubators are constructed on many different systems—hot-air, water tank, hot-water pipes, &c.—but in all of them a circulatio air through the machine is necessary. If the exchange of air i rapid, the eggs will dry out. This tendency must be correcte supplying moisture.

It is very difficult to determine the exact amount of moi required. Mechanical devices which are supposed to indicate

evaporation from the eggs are seldom reliable. It is advisable to do a little experimenting, until one finds the amount of moisture that will give the best results under one's own conditions. For beginners, I would suggest that they supply moisture during the whole of the hatch. It is doubtful whether too much can be supplied, but we do know that insufficient moisture is harmful. The usual method of applying the moisture is by placing a tray of clean water in the machine, but probably with certain types of machine better results are obtained by keeping the floor of the incubator room damp. As evaporation takes place, the moisture-laden air passes into the machine.

Before each hatch, the incubator should be thoroughly scrubbed and disinfected with a good strong disinfectant, such as formalin. It has been definitely proved that some of the worst diseases affecting chickens can be spread by the agency of the incubator; hence the importance of this measure.

The greatest care must be taken of the oil lamp. The wick should be trimmed regularly each day, so that an even flame is produced. A smoky flame will cause soot to form, and soot may cause fire. It is a good practice to fill the lamp and clean the wick in the morning after handling the eggs. Handling the eggs with oily hands is one way to get a poor hatch. The lamp should never be completely filled with oil; about a quarter of an inch of space should be left in the top of the bowl; this will prevent the oil from running over after it warms up and expands. The chimney should fit firmly on to the burner; one should be on the watch for cracks or breaks in the mica of the chimney, as these are often the cause of a smoky lamp.

The machine should be regulated and running nicely for a few days before the eggs are put in, but it must be borne in mind that it is harder to keep an even temperature in an empty machine than in one filled with eggs. Putting in cold eggs will, of course, cause the temperature to drop, and several hours may elapse before it can be brought back to normal.

When running at the desired temperature, the regulating damper should be hung about an eighth of an inch above the chimney; it is then in the best position to operate against a rise or fall in the temperature.

Turning the Eggs.

The machine should not be opened for the first two days. To prevent the chick-embryo from sticking to the shell, and to enable it to grow evenly, it is necessary to turn the eggs regularly from the third to the eighteenth day. Where automatic turning devices are installed, and the turning can be done without affecting the temperature, the eggs should be turned five or six times a day; but where the turning is done by hand, it is not advisable to turn more than two or three times daily. A good method of turning is to take two or three rows of eggs off one

side of the tray, and roll the others over gently into the vacant with the palms of the hands; then put the eggs which were remo the first instance in the places of those which were turned over by This brings about not only an effective turning, but it alters thei tion on the tray. It is advisable to reverse the tray each time replaced in the machine.

Cooling.

The question of cooling is a much debated one, and some poult claim to get good results without cooling. The usual practice, a one that is recommended, is to cool the eggs once a day from the to the eighteenth day, the time of cooling ranging from about 5 m to 25 minutes. Cooling causes the contents of the egg to co slightly, and fresh air is drawn in through the pores of the sh the growing chick.

The eggs should be turned and cooled for the last time on the ev of the eighteenth day. The machine should not be opened aga any account until the hatch is practically complete.

III.—CHICKEN REARING.

Care of the Young Chick.

From the time the eggs start to chip, it is a good plan to h curtain in front of the incubator to exclude the light. Most incu have a glass door in the front, and the first chickens to hatc scramble over the top of any eggs between them and the light. If of these eggs have just chipped, and the eggs get turned over wi chipped side down, there is a great danger of the chickens smothered before they can struggle out.

I do not believe in allowing chickens to drop down into the n tray until the hatch is over. In a great many machines the differe the temperature on the egg tray and that in the nursery tray ab inches below is too great, and the baby chicks that fall down there l they are thoroughly dry often get a chill, which is a bad start in l

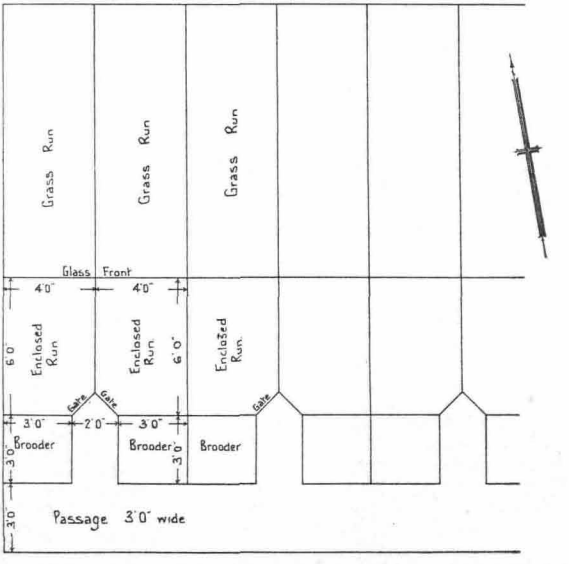
It is far better not to open the door of the incubator after the ev of the 18th day until the hatch is over on the night of the twent day or morning of the twenty-second. Then the chicks can be punched, and put into the nursery tray, to remain there for 24 before they are removed to the brooder.

Some poultrymen declare that this is waste time, as they want the machine filled up again. That can be overcome by having well-ventilated boxes into which to put the chicks. Day-old despatch boxes, if lined with straw, will do, provided they are k

the incubator room. Whatever is done, it should be remembered that chickens require at least 24 hours' complete rest after hatching. In my opinion, this is the very best start they can be given. Warmth and rest are all they want. By adopting this method, there will not be any danger of their being fed too soon, so that the yolk gets a chance of being absorbed. When they are taken to the brooders, they bounce out strong, and ready for what the new world has to offer in the way of food.

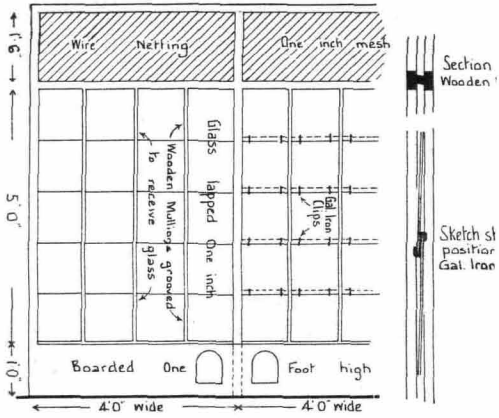
The Brooder.

Putting aside the question of hen hatching and rearing as being quite impracticable on a large scale, a brooder of some kind becomes necessary. Those in general use are very varied, the commonest being



Plan of Brooder House

home-made brooders, some of which are decidedly ingenious. F poultry farmer in a big way, with large laying flocks, the hot pipe system running the full length of the brooder shed is vi indispensable. The beginner, and the breeder for stud purpose will, however, be better suited with the smaller style of brooder.



Front Elevation of Brooder House

Home-Made Brooders.

(1) To Accommodate about 80 Chicks.

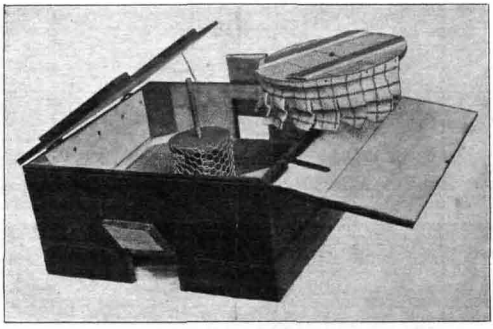
Make a box 3 feet square by 1 foot deep, and hinge the top s the chickens can be fed conveniently.

A lamp chamber can be provided by placing the box on a frame square by 6 inches deep. An opening about 6 inches square be made in one side of this frame so that the lamp can be attende

A hole is required in the centre of the floor of the box, and in hole an inverted flower-pot should be fitted. Some material s asbestos putty should be used to close up the space between the flo and the floor, so as to prevent any fumes from the lamp passing i brooder.

A small pipe is attached to the hole in the flower-pot; this pipe must be long enough to carry the fumes out through the top of the box. The possibility of poison fumes entering the brooder must always be guarded against. The brooder lamp, which should have a $\frac{5}{8}$-in. or $\frac{3}{4}$-in. wick, is placed directly under the flower-pot.

A piece of wire gauze should be put round the pot to prevent the chickens getting burnt. A round wooden cover about 20 inches in diameter, with strips of flannel tacked around the outside, placed over the pot, helps to retain the heat.



One Type of Home-made Brooder.

Plenty of ventilation should be provided by boring a number of holes around the top of the brooder close to the lid.

Another Type.

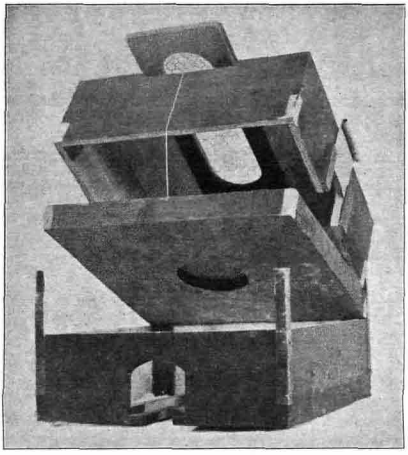
The brooder illustrated on pp. 31-32 is made in three sections; this makes for convenience in cleaning.

No. 1—the lamp chamber—is a frame 3 feet square, and about 9 inches deep. An opening about 6 inches square should be made in one side so that the lamp may be attended to.

No. 2—the heating chamber—is a frame 3 feet square and 3 inches deep, with a sheet of plain iron tacked on each side. A hole 8 inches in diameter is cut out of the centre of the bottom sheet, and the 8-inch disc is fastened with hoop-iron $1\frac{1}{2}$ inches above this hole. The brooder lamp, which should have a $\frac{5}{8}$-in. or $\frac{3}{4}$-in. wick is placed directly under

the hole. The heat of the lamp goes through the hole, and stri the disc, and is distributed throughout the heating chamber, an warms the top sheet of iron more evenly. A piece of bag covere dry sand is placed over the top sheet of iron which forms the f the brooder.

No. 3—the brooder chamber—is 3 feet square and 9 inches dee is like a box without a bottom. It fits neatly over No. 2. of ventilation is provided in the top of the brooder by fitting in a wire netting frame, which can be removed when the chicks require tion.



Another Type of Brooder.

Providing a Run for the Chicks

When using brooders of this type, it has been found advis provide a small run for the chicks for the first few days. The r be made from a shallow box about 3 feet square and 1 foot dee the top and one end removed. It should be placed against the l so that the floor of the run will be level with the floor of the br chamber. This contrivance will prevent the chicks from getti far away from the brooder, and there should be no difficulty in t them to go to and from the heat as they require it. The chicks always be fed and watered in the run, and not in the brooding ch

After seven or eight days the small run can be removed and replaced by a ramp which will allow the chicks to get down to the ground. In fine weather they should be given access to a nice green run, and also to the sunlight, as direct sunlight (not through glass) has a very beneficial effect on growing chicks.

Management.

While a temperature of about 90° Fahr. will be required for the first few days in the brooder, the heat should be reduced some degrees every couple of days, and too much reliance should not be placed on purely thermometric readings. The chickens themselves are the best thermometer. If at all overheated they will spread out evenly as far as possible, and, if cold, will huddle together; the object should be to preserve happy medium. The death rate is usually in inverse ratio to the care bestowed on the chicks, and though at times one hears of from 2 per cent. to 5 per cent. mortality in some special hatch, on the average throughout the season about 15 per cent. to 20 per cent. may be considered reasonable.

When the chickens are from eight to ten weeks old they may be removed from the brooder shed to small pens with ample range during the day time, and warmly bedded up with plenty of straw at night.

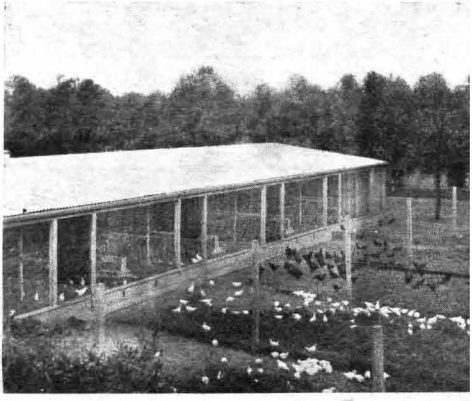
Continued lack of ample range for the young stock year after year will inevitably result in degeneracy, which, probably unnoticed at first, will sooner or later undermine constitutional vigour. It is all very well to talk glibly of 700 or 800 bird flocks on half an acre, as, while that number of pullets may be housed in their pullet year on a still smaller block of land, the stud pens and the young stock must have ample room, and the continued overcrowding or lack of range must be sternly opposed to prevent the gradual but certain loss of supremacy which our birds at present hold.

One of the chief reasons for failure in rearing chicks in brooders is bad ventilation. It should be recollected that the respiration of chickens is much faster than in man. As the chickens have no sweat glands, much of the liquid intake is given off through their respiratory organs, so the air exhaled from the lungs is heavily charged with moisture. This accounts for the high humidity found in badly ventilated brooders, and is often the cause of chickens crowding together, and sometimes smothering. These chickens are generally referred to as sweated. To obviate this danger, it is necessary to ensure good ventilation without draughts, and the constant circulation of air to eliminate moisture.

The next most important thing to remember with chickens is that they require no feed for from 48 to 56 hours after they are hatched. Many thousands of chickens die each year from faulty feeding, and a great many through being fed before the crop and gizzard are prepared to receive food. Perhaps the best thing to give when they are from 48 to

56 hours old is a little coarse sand and fine charcoal. The grains pass through to the tiny gizzard, which is then ready to help grinding of the food as it passes through from the crop. The helps to purify any gases that may have accumulated, and so chick's digestive organs into good working order.

From 1 to 3 per cent. powdered charcoal should be include chick foods for the first two or three weeks. After that, if gr charcoal is made available to them, they will eat as much as they Many of the special chick feeds on the market are entirely uns some of them contain seeds that it is impossible for small chi



Chicken House at State Research Farm, Werribee.

digest. Fortunately, we have in Melbourne a few firms which s in poultry foods, from whom good, safe chicken foods can be o Many people mix their own; in doing so it is well for them to r that the plainer the mixture the better.

The sooner chickens can be got out on the ground the bette the weather is too bad, it is a good plan to cut a sod of grass a it in the brooder run every day; chickens, even at three or four get valuable exercise picking at the green shoots, and probably fi minute insects not seen by us, but which are very beneficial t Milk in some form should be supplied to chicks from t they are first fed. Separated milk is good. Where this is not a

Dried buttermilk or dried skim milk can be purchased. Milk fed to chickens may be either sweet or sour, but it should always be given in the same condition. If sour milk be fed one day and sweet the next, bowel troubles are likely to occur. Cod liver oil is recommended by some, but if chicks have plenty of sunlight, constant supplies of succulent green stuff, and plain, wholesome food, it is doubtful whether any benefit will be derived from oil. In countries where the climate is not so good as ours, and where green stuff is hard to get, cod liver oil may be used to advantage. In too large quantities, however, it is likely to interfere with digestion.

Chickens should be continually shifted on to fresh ground, and even where the space is limited, much can be accomplished in this direction by using temporary hurdles, and not allowing the chickens to run over the whole area.

Minced raw onions can be given once a week from the time chicks are a week old. I know of no better tonic. There should be always a plain dry mash before the growing pullets, and they should be given a wet mash as well. With this method of feeding, their crops will be extended as much as possible. If this is not done when they are young, they will not be able to consume sufficient food to enable them to produce large numbers of eggs.

Cockerels should be separated from the pullets as soon as they can be identified. This will give the pullets more room. Pullets should be placed in their permanent laying quarters at about sixteen weeks old. If left till they start laying, they may resent the change, and go into a false moult.

A Good Mixture for Chicks.

A mixture made from the ingredients specified below has given very satisfactory results in rearing chickens:—

80 lb. maize meal.
40 lb. ground wheat.
20 lb. ground hulled oats.
20 lb. bran.
6 lb. charcoal.
5 lb. bone-meal.
20 lb. dried buttermilk.
5 lb. fine shell grit.
1 lb. salt.
1 lb. superphosphate.

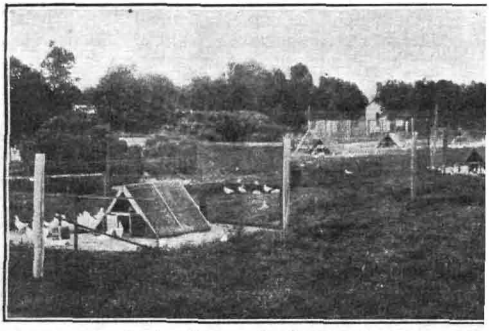
This mixture can be given either as a dry or a wet mash. The usual custom is to have a dry mash always available, and to feed a wet mash a couple of times during the day. It can be fed from the first feed when the chicks are two days old until they reach maturity. For a scratch grain, 40 lb. cracked wheat, 80 lb. cracked maize, and 20 lb. cracked hulled oats make a very good mixture.

Rearing Chickens on the Colony System.

The value of portable colony houses for rearing chickens is no realized by a large number of poultry-keepers, and there is no that, if it were better understood, it would be far more exte adopted.

To lay the foundation of future profits, it is not only neces supply chickens with liberal quantities of good food, but they mu have suitable conditions and environment. Given these, quick and good development will result, with higher egg-production fr pullets, and better prices for the cockerels.

The colony system is more economical in regard to accommo labour, and food. After leaving the brooders, chickens reared system thrive much better than those enclosed in small, bare



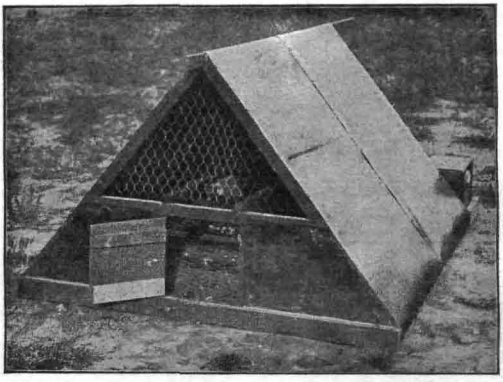
Rearing Chickens under the Colony System.

In the latter, the ground gradually becomes tainted, not offensi *perhaps, and it may not be noticed; still it affects the air close* ground on which the chickens live. After a few days they knov foot of the ground, and, becoming weary with the monotony, v run about as they would if given greater opportunities of natural food, such as insects, grubs, seeds, &c., and a variety o food. By keeping the birds moving about, they will attai health and proper development.

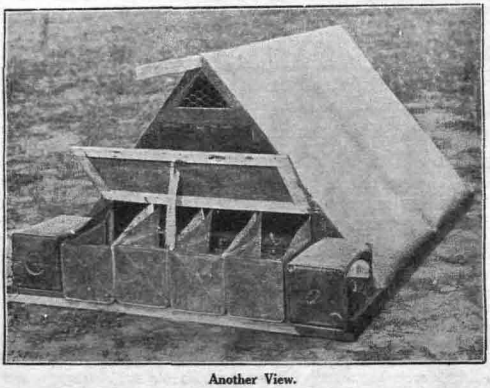
The Colony House.

Portability, adaptability to weather conditions, low co simple construction are the features of the colony poultr illustrated on page 36. Portable houses have been used for a grea years with highly satisfactory results. Its dimensions are 6

5 feet, x 4 feet high, built tent shape. A house of this size will accommodate 50 chickens, 10 or 12 weeks old, for from 6 to 8 weeks, when the number should be thinned down by the removal of the most forward pullets to their permanent laying quarters.



Portable Fowl House.



Another View.

In this design provision has been made so that the house conveniently used for laying hens after the chicken season is ov it will provide accommodation for from 20 to 24 layers. Portion back of the house, being hinged, can be lifted up, and four nests from kerosene tins cut as directed below, fitted in. The entrance nests is from inside the house, thus the hinged portion forms the the nests, and can be lifted when the eggs are being gathered. width of the back of the house allows space for six kerosene tins nest boxes, one for a water tin, and one with separate spaces fo grit and charcoal. These tins all rest on the frame of the hous therefore, no inconvenience is experienced when shifting the The building is so light that it can easily be shifted by two ch ten or twelve years of age, and its shape is such that wind, e Werribee, has no effect on it.

Wire-netting floors are desirable in these houses, and it is ad to place in them a frame of 2 x 1 battens on edge, and cover wire-netting stretched tight; this frame should fit neatly ins bottom of the house. The advantages of this frame are, that rain-water run under the house, the birds have a dry place to upon. Further, when the house is being used for laying h prevents their carrying dirt into the nests and soiling the eggs. prevents loss from smothering. Every poultry man knows the shifting growing chickens to new quarters. Great loss is expe at times, as the chickens often sleep on the floor and crowd one of another, with the result that those underneath smother. Wi netting floor, which is a couple of inches off the ground, even chickens do heap up, those underneath get sufficient air throu meshes.

It is seldom, even on a large farm, that a great number of c are to be put out at one time; therefore, a few hurdles are su Five of them made of 2 x 1 hardwood, 10 feet long and 3 fe covered with wire-netting, should be enough for one house. Of hurdles of this height would not keep birds in for any length o but it will be some days before chickens, ten or twelve wee attempt to fly over. By that time they will be well used to th house, and the hurdles may be removed; for even though the birds from the various houses mingle during the day, especi feeding time, at roosting time they will return to their re houses.

If it is desired to run cockerels in the same paddock as pu suitable enclosure can easily be made. What is required is a set frames of 3 x 1 hardwood battens, 18 feet long, 6 ft. 4 in. hig two bars 6 feet from each end, and covered with 72 x 2 wire- The battens at each end of the frame should be cut 6 ft. 10 i allowing 3 inches to project above and below the frame. The pr

ieces at the bottom should be pointed, so that when erected they can asily be driven into the ground. A loop of hoop-iron may be slipped ver the projecting pieces at the top, coupling them together. If the oops be made a neat fit, they will hold the frames very securely. This ıethod of fastening the hurdles is much better than simply nailing them, s they can then be taken down and erected much more quickly, and ithout damage to the hurdles. Access to the yards is easily gained y slipping off the loop at one corner and stepping through; but, if equired, it is a simple matter to let a small gate into one of the frames. his, however, will probably not be necessary.

A yard of this size contains over 300 square feet, and is sufficient for 0 chickens for several days. At the end of that time the house can be hifted, and the frames re-erected in a few minutes on fresh ground.

Breeding Pens at State Research Farm, Werribee.

The transferring of chickens from the brooders to these colony houses hould be done late in the afternoon. After feeding them they should e placed in the colony house, the door closed, and the hurdles placed n position round the house. They should be left till next evening, when he door can be opened and feed and water supplied. After feeding hey will return to the house to sleep without any trouble; in two or hree days the hurdles can be removed and used for the next lot to e put out. When shifting the houses they should be kept about the ame distance apart, and not moved too far at one time (a few feet s sufficient), otherwise there is a danger of the birds refusing to go to he house in its new position, and they will camp on the ground where he house last stood.

Materials for the House.

The material required for the construction of the house and l described is as follows:—

For the house—

Two pieces of 3 x 1 hardwood, 7 ft. 2 in. for the bottom.
Two pieces of 3 x 1 hardwood, 4 ft. 10 in. for the bottom.
One piece of 2 x 1 hardwood, 5 feet for the bottom.
Six pieces of 2 x 1 hardwood, 4 feet for sides.
One piece of 2 x 1 hardwood, 8 feet for ridge.
Two pieces of 2 x 1 hardwood, 3 feet for perches to rest on.
One piece of 2 x 1 hardwood, 3 ft. 4 in. to hinge nest lid to.
One piece of 2 x 1 hardwood, 1 ft. 4 in. for ventilator at back.
Two pieces of 2 x 1 hardwood, 1 ft. 3 in. for door frame.
Two pieces of 2 x 1 hardwood, 5 ft. 10 in. for perches.
One door, 1 foot square.
Six pieces No. 14 gauge wire, 8 ft. 6 in. to support ruberoid.
Two pieces No. 2 ply ruberoid, 8 ft. 4 in. for roof.

For front—

One kerosene tin flattened out and cut in half—half to cover in e of door.
One pair of 1½-inch butt hinges.
One piece of wire netting, triangle shaped (3 feet at base, 2 feet to

For back—

One and a half kerosene tins flattened out—one above the nest b a quarter on each side of them.
One piece of tin, 3 ft. 3 in. by 1 ft. 3 in (cover for nests).
One pair butt hinges, 1½ inches for cover.
One piece of wire netting for ventilator, 1 foot at base, 8 inches
Four kerosene tins for nests.
One kerosene tin for water.
One kerosene tin for shell grit and charcoal.

For floor frame—

Two pieces 2 x 1 hardwood, 5 ft. 7 in.
Four pieces 2 x 1 hardwood, 4 ft. 7 in.
One piece wire netting, 5 ft. 7 in. x 4 ft. 7 in., 1½-in. mesh.

For hurdles—

Two pieces 2 x 1 hardwood, 10 feet, top and bottom rails.
Two pieces 2 x 1 hardwood, 3 ft. 10 in., for ends.
One piece 2 x 1 hardwood, 3 ft. 4 in., for centre stay.
Piece of wire netting 10 feet x 3 feet.
To make loops of hoop-iron, cut pieces 11½ inches long, lap 1 inch, a

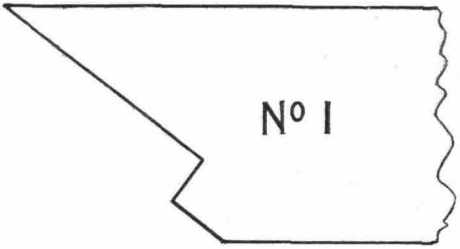
For large-frame hurdles—

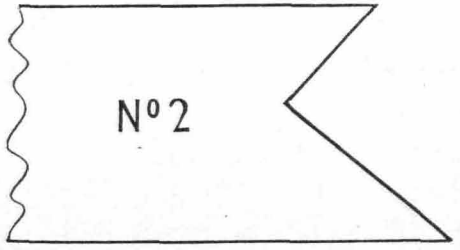
Two pieces 3 x 1 hardwood, 18 feet long, top and bottom rails.
Two pieces 3 x 1 hardwood, 6 ft. 10 in. long, for ends.
Two pieces 3 x 1 hardwood, 6 ft. 4 in. long, for stays.
6 yards wire netting, 72 x 2.
To make loops of hoopiron, cut pieces 1 ft. 3 in. long, lap 1 inch, a

How to Build the House.

The following is written in the hope that it will be some assistance to the poultry man who wishes to do his own building:—

Scarf out sufficient at the end of each of the 7 ft. 2 in. pieces of timber to take a 2 inch x 1 inch batten; lay the two 7 ft. 2 in. pieces 4 ft. 10 in. apart with the scarfed edges up, and nail on the 5-ft. 2-in. x 1-in. piece. Next place one of the 4 ft. 10 in. pieces 14 inches from this, and the other 4 ft. 10 in. piece between the ends of the 7 ft. 2 in. pieces, and nail securely together. Turn this over, and it will form the bottom

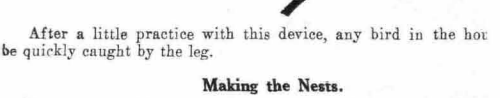




frame of the house. Then take four pieces of 2 x 1, 4 feet long, and cut the ends by the template shown, which is actual size, No. 1 for the top to receive the ridge pole, No. 2 for the bottom, which fits the bottom frame. Place two of these pieces in position at the front, and two at the back, and nail to the 3 x 1 frame inside; put the 8-ft. ridge pole in the places cut to receive it, allowing it to project 6 inches in front and 18 inches at the back. This provides a good hand-hold for shifting the house about. Then take the other two pieces of 4-ft. timber; use the same template, but cut the angles on the flat, as these two pieces are for the centre of the house where the ruberoid joins. Next cut the two pieces of 3-ft. timber so that they will fit between the

uprights at each end of the house; on these the perches will rest
the piece of 1 ft. 4 in. to fit between the uprights at the back 8
from the top; this is for ventilation. Then nail the two pi
1 ft. 3 in., 1 foot apart, to the bottom frame at the front, so as t
the door frame; the tops of these help to support the 3-ft. pi
perches rest on. Nail the piece of 3 ft. 4 in. across the back,
from the bottom frame, so that the hinged lid of the nest tins
hung to it. Then take the six pieces of 14-gauge wire; dril
8 inches apart in the bottom frame of the house; fasten one
each of the wires in these holes, pass the other ends over th
pole, stretch fairly tight, and fasten to the frame at the bottom
other side. These wires support the ruberoid, and prevent i
sagging. One kerosene tin flattened out and cut in half is su
to close in the spaces each side of the door; the space above th
is covered by a piece of wire netting. To close in the back, t
light frame, and cover it with a piece of tin 3 ft. 3 in. x 1 ft
By hinging this to the 3 ft. 4 in. piece of timber at the back s
made for the nest tins. Flatten out a whole kerosene tin and l
another. Spread a quarter of the flattened tin over the space
side of this hinged lid; the balance will be required to close in th
between the hinged lid and the ventilator. Two inches of the
of this tin should be bent outwards at right angles, in order to p
rain running down the back of the house into the nests. The ver
space, about 1 foot by 8 inches to the peak, should be covered
piece of wire netting. Bore holes 1 foot apart in the two pi
timber that are to support the perches, and corresponding holes
ends of the perches. They can then be held in position by pla
nail in the holes. If this be done it will be easy to remove the p
at any time for inspection for mites, &c. The ruberoid can t
tacked on, the door fitted, and the house is then complete.

The most convenient way to catch birds in these houses is t
a light stick or cane 6 feet long, with a piece of No. 8 fencin
fastened to the end, and bent as shown hereunder:—



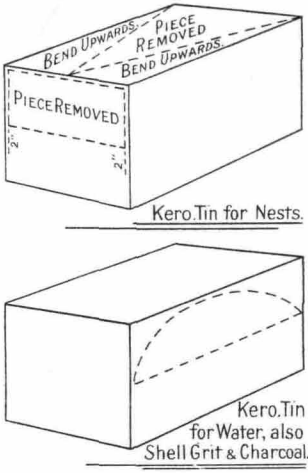
For Catching Birds

After a little practice with this device, any bird in the hou
be quickly caught by the leg.

Making the Nests.

Cut kerosene tins along dotted lines as indicated in diagr
page 42. Remove the pieces at the end dotted round, an
cut down 2 inches on each side where indicated by dotted lines.
the three corner-pieces on the top, and bend upwards. The p
tin which has been cut down 2 inches in the front should be l
fit over the 3 x 1 batten on the bottom frame of the house. Th
be sufficient to hold it in position without nailing; the back

nest tin will rest on the 2 x 1 piece of timber. These nest tins should always be removed when the house is to be used for chickens, or they will all crowd into them to sleep.



IV.—POULTRY REARING AS A SIDE-LINE.

In the Orchard.

Orchardists are slow to realize that a considerable increase in their income could be obtained by running poultry amongst their trees. Portable houses are particularly recommended for use in the orchard. By shifting them between the trees a few feet every two or three days the ground will be well manured, the birds will be greatly benefited by the shade of the trees, and in their foraging will rid the orchard of many destructive insects. Several houses can be used in the same orchard or paddock, if placed 50 or 60 feet apart. Movable hurdles are used to make a small enclosure round the house for two or three days. By the end of that time the birds will have become accustomed to their particular house, and the hurdles can then be taken away and used for another house.

In the northern parts of Victoria, poultry-rearing can be made a profitable adjunct to citrus-growing. The poultry pens may consist of wire-netting yards enclosing six or eight well-grown orange trees, which

provide ideal shelter from the sun during the long hot summ
although the hens eat the leaves for about 12 inches from the
this is an advantage, as it allows the breeze to blow through
weather. The soil under and around the trees does not requi
working or manuring, as the birds do all this while scratchi
exercise.

In the southern districts of the State, many apple-growers c
poultry farming with orcharding; but as apple trees lose their fol
the autumn, it is necessary to provide houses in convenient parts
orchard. Some successful orchardists say that since they hav
flocks of poultry in their orchards they have found the purcl
artificial manures to be unnecessary.

On the Farm.

The production of eggs is essentially a farm enterprise, and
most profitably conducted as part of the general farming operat

A flock of 200, or perhaps more, can be kept without interferi
other work, and with very little additional labour and expens
essentials for success are:—

1. Pure-bred stock of good laying strain.
2. Good housing.
3. Good feeding.
4. Intelligent marketing.

There is no "best" breed suitable for all purposes, but it
accepted fact that pure-breds pay better than cross-breds. The
tages of pure-breds are: Higher production of eggs and more unif
when sold for table purposes. A further advantage, though not a fi
one, is that a flock of pure-bred birds of uniform size and colour p
a much better appearance on the farm than one of all sorts and
tions

In most cases when farmers complain that the keeping of po
unprofitable, it is due to the fact that the birds are not pure-bred
pure, are not bred from a high-producing strain.

A number of farmers now realize that high egg production
bred into fowls just as surely as high butter-fat production is br
dairy heifers Unfortunately, the majority of farmers look
poultry as too insignificant for their attention, yet no other farm
tion will pay as well as poultry-keeping, bearing in mind the am
capital invested.

From numbers of reputable poultry-breeders good stock can
chased at reasonable rates; but, unfortunately, as in most othe
nesses, there is a percentage of breeders who distribute poor
stock. There are, however, several sources from which a farm
obtain information as to the reliability of suppliers of stock,
chickens.

Is Poultry-rearing Profitable?

To show what profit can be made from a flock of 50 birds in
months, I quote the following figures of an experiment. The

quantity of food consumed per bird during this period was:—Bran, 7 lb. 6 oz.; pollard, 14 lb. 12 oz.; dried butter-milk, 4 lb. 5 oz.; wheat, 26 lb. 10 oz.; Algerian oats, 13 lb. 4 oz.; maize, 13 lb. 4 oz.; barley, 6 lb 10 oz. The total quantity of food fed was 86 lb. 4 oz., and its cost 9s. 3¾d. The number of eggs laid was 15 dozen, and they realized £1 3s. 0¼d.; thus the profit over cost of food was 13s. 9d. And it must be remembered that this was the average return from one of 50 birds. It is difficult to get reliable figures from farms, but it is known that this amount of profit over food cost is being obtained on many irrigation farms in the north.

With good shedding, plenty of litter on the floor, automatic water supply and dry mash feeding, 200 birds should not take up more than an hour per day, and with this number of birds many farmers have made from £90 to £120 per annum over food cost though present day returns (1933) are on a much lower scale.

The only successful dairy-farmers that I have met are those who are fond of their cows, take a pride in them, and study their feeding and comfort in every way. And unless they are prepared to do the same with their hens, I would strongly advise them to leave poultry out of their farming operations.

In some cases farmers are not getting as high a price for their eggs as they might, because of bad marketing, lack of regularity in gathering the eggs, want of care of the eggs after gathering, marketing eggs ungraded as to size, marketing dirty-shelled eggs, and bad packing. All these things mean depreciated prices.

Housing on the Farm.

For fowls to be profitable as egg-producers, houses need not be expensive; but must have dry floors, and must be rain-proof and wind-proof, yet well-ventilated. Unfortunately, the majority of farmers think any kind of a house will do, and very often consider a tree good enough for a roosting-place.

Fowls will certainly keep in better health roosting in trees than when housed, but if they are exposed to cold winds, &c., too much of the food eaten has to be devoted to the upkeep of their bodily warmth, leaving a lesser amount for the manufacture of eggs; therefore poor housing is not economic from a food-consumption point of view.

The most suitable depth for houses for laying fowls is 14 to 16 feet, and a shed 30 feet by 15 feet will be suitable for 100 birds, and one 60 feet by 15 feet will house 200 birds. On a farm where bush timber is available, or where second-hand timber can be bought, buildings for poultry can be erected at low cost.

Feeding on the Farm.

The farmer is probably in a position to feed fowls more economically than many poultry-farmers. The basis of nearly all mashes is bran and pollard. Farmers who feed bran to their cows, and pollard to calves and pigs, are usually in a position to buy in fairly large quantities, and, therefore, at a cheaper rate than can the average poultry-farmer.

I have an open mind as to the best method of feeding fowls for egg-production, as I know poultry-farmers to be successful with dry-mash feeding, others with wet mash; but for a farmer, the dry-mash method would save a considerable amount of labour, as hoppers can be built to hold enough mash for a week; this means that the fowls need no attention in the morning, a little green feed can be fed at mid-day, and a full feed of grain at night, followed by as much green feed as they will eat.

The Value of Milk.

There is no better aid to egg-production than milk, either separated milk, butter-milk, or dried butter-milk. In fact, some of our largest egg-producers consider milk so valuable that they keep sufficient cows to supply the amount necessary for their birds. In several feed experiments carried out at the Werribee Research Farm, it has been demonstrated that dried butter-milk is a very valuable addition to the mash

The Value of Greenstuff.

The farmer has another advantage in the fact that he always has, or should have, ample green feed for his cows, in the shape of green oats, green barley, clover, millet, green maize, or lucerne, all of which are excellent for fowls. I am of the firm opinion that no man can get the best returns from his birds unless they have constant supplies of green food, as not only is it necessary from a health point of view, but also it is a wonderful aid to the rapid digestion of other foods. The whole success of the poultry-farmer depends on how much food he can get his birds to eat, digest, and turn into eggs.

The value of succulent greenstuff for laying hens has been demonstrated at the State Research Farm, Werribee. In a food experiment three pens of 50 birds each were fed, housed, and treated exactly the same in every particular except that No. 5 pen (in addition to the ordinary ration of meals and grains) was fed such succulent green food as was in season; No. 8 pen was fed lucerne chaff that had been soaked in water, and No. 10 pen was not given any green feed at all. The result was:—

No. 5 pen (fed succulent green feed) produced 7,883 eggs, valued £52 16s. 8d.
No. 8 pen (fed lucerne chaff) produced 7,425 eggs, valued £47 4s. 5d.
No. 10 pen (no green feed) produced 6,610 eggs, valued £41 4s. 4d.

Thus the pen fed greenstuff showed a return of £5 12s. 2d. more than that from the pen given lucerne chaff, and £11 12s. 4d. more than the return from the pen to which no green feed was allowed. For the three months May, June, and July, when eggs were at the highest price for the year, the pen fed greenstuff laid 697 eggs more than the pen fed lucerne chaff, and returned £6 11s. 9d. more in money. During the spring the pen fed lucerne chaff gained a little, but eggs were then at a low price.

The Value of Poultry Manure.

One aspect of the value of poultry on the farm that is often not taken into consideration is the value of the manure. Poultry manure from most of the large egg-producing plants is being eagerly sought after by orchardists and market-gardeners, and some of it is transported over fairly long distances.

It is estimated that a fowl produces approximately 90 lb. of manure in twelve months, so it would be safe to estimate that from every 100 birds 4 tons of valuable manure is obtained. The value per ton is usually about £2 5s., but some farmers I know would not sell it for double that amount, because they find it gives such splendid results when used for crops and for the top-dressing of pastures.

During 1927 a poultry-farmer in the Bendigo district sold all the manure from his sheds, and found it was being used for tomato-growing; so he resolved to give tomato-growing a trial. The area of land available was only an acre, and no manure was used other than the droppings from his poultry houses, yet the profit from the acre plot, after deducting cost of plants, labour, &c., was £120.

The policy of the Department of Agriculture is to encourage poultry-keeping as an adjunct to other agricultural operations, and it is my opinion that in few places can it be made more profitable than on a dairy farm.

With the advantages already quoted in the way of milk and ample supplies of greenstuff, large numbers of eggs can be produced at the time of the year, i.e., April, May and June, when they are at their highest market value, and this is the time when many farmers find it difficult to make ends meet.

Suggestions for Poultry-keepers.

If good quality eggs are to be produced, the following suggestions should be followed:—

1. Isolate or sell all male birds after 1st October.
2. Gather eggs twice a day if possible, but at least once a day.
3. Keep eggs in a cool place (the temperature should never exceed 60° F.).
4. Protect them from sun, heat, moisture, and bad odours.
5. Treat them as you would choicest cream or butter.
6. Market only clean-shelled, large eggs. Small and dirty-shelled eggs should be consumed on the farm.
7. Market eggs twice a week if possible, but at least once.
8. Keep eggs clean by providing clean houses, plenty of clean litter on the floor, and roomy nests; and by changing nesting material frequently.
9. Chickens intended for egg-production should be hatched in July, August, and September only.
10. Breed only from second and third season hens, and from pedigreed male birds.

Back-yard Poultry-Keeping.

Most city men look upon the hen as a mischievous pest, ever ready to fly into the garden and scratch up the garden seeds and all the choicest seedlings. This probably is what she will do if she gets a chance, for she knows she has a reputation to keep up as an egg producer, and if she be not given the right materials to enable her to do the job, she

will take the first opportunity of helping herself out of her owner's or, maybe, a neighbouring garden. For it is the very things that are to be found in the garden in the shape of grubs, insects, and green shoots that the suburban poultry-keeper so often neglects to supply.

Various societies in Melbourne interest themselves in the prevention of cruelty to horses, dogs, &c., and I sometimes think there is room for *still another—a society for the prevention of cruelty to the hen.* In most cases this cruelty is due to ignorance, or perhaps a want of thought. At many suburban homes fowls are kept ostensibly to supply eggs for the house, but the conditions under which they are compelled to exist make it impossible for them to lay a profitable number of eggs. It is not strange, therefore, that one so often hears the remark "It's cheaper to buy eggs than keep fowls." Many people suppose that any damp, dark corner of a yard is good enough for fowls to live in every day of the year, and think that, irrespective of age or quality, they should lay large numbers of eggs. It is only the healthy, active, and contented hen that will lay a large number of eggs, and for her to be healthy and active she must have bright, sanitary quarters, plenty of clean straw or litter to scratch in, and be supplied with a variety of good wholesome food.

A small number of fowls should be kept by families in the suburbs of all large cities. The eggs from small flocks may be produced at relatively small cost, because of the possibility of utilizing table scraps and kitchen waste which otherwise would be thrown away. A small lot of hens, *even as few as six or eight, should produce sufficient eggs* for a family of four or five throughout the year, except during the moulting period, which occurs in late autumn and early winter, and by the preservation of surplus eggs laid in the spring and early summer, this *period of scarcity can be provided for. Not only will the eggs from the* home flock materially reduce the cost of living, but the superior freshness and quality of the eggs are in themselves well worth the effort expended.

Objection is sometimes raised to the keeping of fowls in towns because of the odour which may result, and also because of the noise made by the roosters crowing. Where there are city regulations prohibiting or controlling poultry keeping, it is necessary to find out what the provisions are and to conform to them.

If dropping boards are used under the perches, and they are cleaned daily, or if the floors of the houses be covered with litter, say, 5 or 6 inches of straw (and the litter be changed every ten or twelve weeks), provided the floor is perfectly dry, there will be no annoying odours.

The Keeping of a Male Bird Unnecessary.

Male birds need not be kept, unless the breeding of chickens is desired. The fact that there is no male in the pen will have absolutely no effect on the number of eggs laid by the hens. A pen of six Black Orpington pullets at the Burnley Egg-laying Competition made an official record for winter egg production by laying 643 eggs in 122 days, ending 31st July, and no male birds are allowed with the pullets at the competition.

It is unwise to hatch chickens intended for egg production, except in the months of July, August, and September; and the male bird should be disposed of just as soon as sufficient eggs have been procured for the hatching of the required number of chickens. This is desirable, not only to prevent the chance of his annoying residents by crowing, but also to save the expense of feeding him. Another reason is that infertile eggs keep better than fertile eggs, and, consequently, are superior for preserving and for market.

The Best Breed.

The kind of fowl to keep must be left to the householder. My advice always is to select the breed for which one has a preference, because one is more likely to give that breed better attention than a breed that does not appeal to one.

Egg production is a matter of strain more than breed, and good egg producers are to be found in many breeds, but certain of them are superior for table purposes. For egg production only, White Leghorns have proved their worth in almost every country in the world, and they will probably thrive better under intensive conditions than do most other breeds. The Australorp has the recommendation of being both a good layer and a fair table bird, but is not likely to give as good results under the intensive conditions as White Leghorns. The birds in greatest demand in England as table birds are the white-legged breeds, with a white skin and white fat; some of these breeds have been greatly improved as egg producers, and are fast coming into favour in Victoria. Of them, Light Sussex and Buff Orpingtons are fair layers and beautiful table birds. They are docile, easy to handle, and can be confined with very low fences. I find 4 feet of wire-netting sufficient to keep Light Sussex out of my garden. Any of the Wyandotte varieties are ornamental, make nice table birds, and lay a fair number of eggs.

Whatever breed the householder decides to keep, he should procure his stock from a reliable poultry-breeder, remembering that a good article cannot be bought at a cheap price. If it is decided to purchase a setting of eggs and hatch them, it is better to pay 10s., or even 20s., for a setting of thirteen to fifteen eggs from good stock rather than to buy eggs at a low price, and go to all the trouble and expense of rearing chickens only to find the pullets unprofitable.

Day-old chicks from good stock can be bought at from 10s. to 15s. a dozen, but it should be remembered that over a season the percentage of cockerels to pullets is usually about the same. Pullets just on the point of laying are worth anything from 10s. to 20s. each, but some breeders will sell young pullets ten to twelve weeks old at 8s. to 12s. a pair.

Whatever is decided on, it is wise to make full inquiries as to the quality of the stock to be purchased, and, where possible, visit the breeders' yards. Most of them are always willing to show visitors over their pens, and give what information they can. The number of birds that can be most efficiently kept depends, firstly, on the space available, and secondly, on the amount of table scraps available for feed. It is a mistake to overstock; better results are obtained from a few hens in a small yard than from keeping a larger number there.

Housing in the Back Yard.

In housing a large number, it is usual to allow 4 square feet to each bird; but for small lots, more space per bird is required. A small shed, 10 feet deep and 8 feet wide, will make comfortable quarters for ten or twelve hens; a smaller house, of course, would suffice, but if given the extra space they will certainly thrive better. This shed should face the east, and be so situated that the early morning sun shines right into it, purifying the air, and keeping the litter dry. If the shed is 6 feet high in front and 5 feet at the back, there will be sufficient head room for the attendant when cleaning out or attending to other duties. For larger flocks sheds should be both deeper and higher. The perches should be about 2 feet from the ground, and about 8 inches perch room per bird should be allowed. If more than one perch is required, they should be all on one level and 15 inches apart. The perches should be at least 2 inches wide—2-in. x 1-in. battens will do if the perches are short, but in longer houses 2-in. x 3-in. timber on edge will be more satisfactory.

Housing need not be expensive, but a dry floor is essential; one of concrete or brick is to be preferred; good ventilation is necessary but there must be no draughts. What is known as the open-fronted type of house is quite satisfactory, if boarded up 18 inches from the ground, and the rest of the walls wire-netted. The boarding will keep the litter from being scratched out, and so making the paths untidy.

Guarding against Vermin.

Perches, nest-boxes, and inside fittings should be up off the floor, and be so constructed that they can be easily removed for examination for vermin. All timber used inside, including perches, should be given a coating of hot tar; this fills up any crack or gum veins, and there will be less harbour for red mites to breed in. These insects are really the greatest pest the poultryman has to contend with, and they are probably the cause of more loss in egg production than any other kind of vermin, for all the other kinds can be easily kept down by regular attention.

It is only necessary to paint the perches and joints of the timber with tar oil, crude phenyle, or sheep dip about every three months; but two applications should then be given, the second following ten days after the first. The reason for giving a second application is that red mites lay their eggs in cracks and crevices, and these eggs hatch in eight to nine days. Great care should be taken when applying the oil, or whatever mixture is used, for it is very easy to miss some of the mites; if so, they will hatch out, and the whole place be re-infested in a few days. By giving a second painting after an interval of ten days, one is likely to kill them all, and the house will be free of mites for some time. Red mites live in the cracks and crevices of the houses and perches, and visit the birds only at night, engorge themselves with blood, and retire to their hiding places till the next night.

Hens will rid themselves of other vermin if given access to a good dust bath, which can be supplied in a box 2 feet or 2 ft. 6 in. square, 9 inches deep, filled to the depth of 6 or 7 inches with road dust, ashes, and two or three handfuls of sulphur. If this dust is sprinkled with water in the hot weather, birds will enjoy scuffling in it, and on

the very hot days it will help a great deal towards lowering the temperature of their bodies, and so ward off attacks of heat prostration. Mortality from this cause is very high on some farms; from 20 to 80 birds have been lost on one farm during a hot spell. Birds liable to be affected by the heat are usually those in full lay, because the best layers are heavy feeders, and they feel the heat most. If dust baths are kept damp, and the houses and litter sprayed with water during the hottest part of the day, usually from 2 p.m. to 4 p.m., much of the trouble can be avoided.

A good dust bath does a great deal to prevent another parasite from attacking the birds' legs. This is known as scaly leg mite, which is a minute insect that breeds under the scales of the birds' legs, causing irritation, and making them unsightly. Further, it is possible that these insects are carriers of disease. Scaly leg mite can be easily cured if taken in hand in the early stages. As soon as the scales show white under the edges, the bird's legs should be washed with soap and water; soapsuds after washing day are very good for the purpose; after a thorough washing and scrubbing with a soft brush, a little vaseline and sulphur or lard and sulphur, well rubbed in, will quickly effect a cure.

Feeding in the Back Yard.

A small number of fowls can be very economically fed, if all kitchen waste and table scraps are saved. Potato skins, &c., should be either put through a mincer, or else cut up and boiled with bones and meat scraps, and mixed with bran and pollard, but care should be taken that the mixture is not sloppy, sodden, or too dry; a nice crumbly condition is what should be aimed at. I find the most satisfactory way to mix the mash is to place the bran in a mixing bowl, pour the boiled scraps on to it, then mix thoroughly and dry off with pollard to a crumbly condition. Then any green stuff, cabbage, lettuce, or silver beet may be added; these green stuffs should never be boiled.

Rhubarb leaves should not be used for poultry; they contain oxalic acid which is injurious. Salt meat should not be given at any time. I do not think salt is necessary at all where table scraps are used; but some poultrymen use small quantities (about 1 lb. in every 100 lb. of feed).

Fowls should be given as much food as they will clean up in about twenty minutes; any that is left should be removed. If mash is fed at 7 or 8 o'clock in the morning, a little mash or grain (say half an ounce of grain per bird) can be given at mid-day with a small quantity of green stuff. The evening meal should be a full feed of whole grains —a mixture of wheat, maize, and oats. Barley also is a good poultry food. Excellent results have been obtained when feeding Algerian oats and barley only, but fowls prefer wheat to any grain.

In all the free choice feeding experiments carried out by me at the Research Farm, when birds have had equal access to the four grains mentioned, they have in some months eaten more of one grain than another, but at the end of the year, when the total consumption was

made up, the order of preference has always been wheat first, Algerian oats second, maize third, and barley fourth.

It is advisable to feed mixed grain, but it is also well for the poultryman to buy the varieties separately and mix them himself; he can then better determine the value of the mixture. In many samples of mixed grain offered for sale, the mixing has been done in such a way as to conceal some inferior grain that could not be sold by itself.

Fowls should have some succulent green stuff every day, and a little given after the grain feed at night will be of great benefit. Clippings from English lawn grass are very good, but milk thistles, barley grass, vegetable leaves can all be used.

Vegetable leaves and stumps should never be thrown on the ground in the poultry run; some of them may be left to decay, and possibly be the cause of ptomaine poisoning, or of an outbreak of infectious disease. Green stuff, if not chaffed, can be placed in wire-netting baskets and hung up in the pen, and the birds will pull it through the mesh.

Charcoal and shell grit or coarse gravel should always be available, and a constant supply of clean cool water is a necessity. Minced raw onions at the rate of three-quarters of an ounce per bird, once a week, is a splendid tonic. Spices and condiments are unnecessary, and some are injurious.

If good stock, and good stock only, be kept in clean sanitary houses, and given wholesome clean food, the owner will be surprised at the number and quality of the eggs produced.

For a calendar of operations see page 138.

V.—FEEDING AND FOODSTUFFS.

The six essentials for successful poultry culture are mating, hatching, rearing, feeding, housing, and marketing and of these probably the most important of all is feeding. A moderate bird skilfully fed *would give better results than a highly pedigreed bird indifferently* fed. The slightest neglect of the laying hen results in an immediate decrease in the egg yield, and possibly causes a false moult. Some knowledge of the constituents of the various foodstuffs and the functions that they perform is therefore necessary.

The Nutritive Ratio.

The nutritive ratio is the proportion of digestible nitrogenous matter to the rest of the digestible matter (non-nitrogenous) in any foodstuff. The nitrogenous matter repairs the waste of tissue, and is constructive, in that it builds up flesh, bone, feathers, &c., and is usually referred to as "protein." The non-nitrogenous matter consists principally of starchy matter, fibre, and fats or oils, and helps to maintain the body heat and support respiration, whilst certain oily secretions are derived from the fats and oils which assist lubrication. Fats and oils are two and a quarter times as heating as starchy matter, consequently to arrive at the correct nutrient ratio the percentage of digestible fat is multiplied by 2¼ to express it in the same heating terms as that of the *starchy matter.*

In the case of a foodstuff containing the following percentages of digestible ingredients:—

12% nitrogenous matter
55% starchy matter plus fibre
2¼% fatty matter

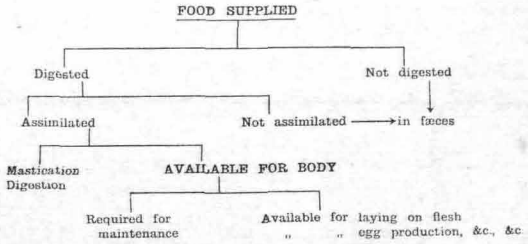
the nutritive ratio would be $12 : (55 + 2\frac{1}{4} \times 2\frac{1}{4})$

$12 : 60$ (approximate)

$1 : 5$.

The Balanced Ration.

By the term balanced ration is meant a mixture of foodstuffs containing sufficient nutrients in the right proportion *for the purpose required*. It is not therefore possible in actual practice to compose a mixture which can be fed in the same proportion all the year round For one thing climatic conditions will not permit it, and slight modifications are also necessary to render the food continuously appetising. Identically the same food day after day eventually must pall on the most hardened palate. Generally speaking, a balanced ration is one having a nutritive ratio of approximately 1 : 5, and in compounding a ration this ratio should be aimed at. Hence protein concentrates are necessarily added to cereals and green fodders, which have a wide nutritive ratio. The grain ration as well as the mash must be considered when building a balanced ration. It is not sufficient to consider only the mash, as if this has a nutritive ratio of 1 : 5, the complete ration, including the grain, will be too wide. The nutritive ratio is considered "wide" if it is greater than 1 : 5. The chart hereunder will show the reader on what uses food taken into the body of a fowl is ultimately expended.



Principal Constituent of Food Materials.

Food constituents may be classified as follows:—

(1) Water, (2) Protein—Nitrogenous substances, (3) "Nitrogen-free" extract or starchy matter, (4) Ether extract—fats and oils, (5) Fibre, (6) Ash.

Water.

All foods contain a certain amount of water, even those that are apparently dry, and in the animal body water constitutes about two-thirds of the body weight. Insufficient water is supplied by the food, so that an additional amount of water must form part of a fowl's *ration, and such water must be of good quality and low in mineral salts.*

The functions of water are—

(*a*) to supply firmness and rigidity combined with elasticity to the tissues;

(*b*) to act as a solvent for the food materials;

(*c*) to carry food materials and waste products.

Protein.

Protein is the accepted name for a class of compounds all of which contain nitrogen, but have varied physical and chemical properties. The percentage of protein in foods is obtained by determining the percentage of nitrogen and multiplying the latter by 6.25.

Protein is divided into (*a*) Albumenoids, (*b*) Amides. These latter contain nitrogen, but possess properties greatly removed from those of bodies recognized as true proteids. Amides are more abundant in green fodders, roots and tubers than in mature foods.

Vegetable proteids are the sole source of animal proteids. The proteids go to form muscles, connective tissue, skin, feathers, beak, and claws, so may be described as "flesh forming." They may also, however, serve for the production of animal fat, and can be used for the production of energy.

Proteids are used in more ways than are any other class of nutrients.

Amides serve simply as a source of heat; although containing nitrogen they do not form tissue. By producing heat they save the proteids, but for this purpose they are of only half the value of the carbo-hydrates proper.

Nitrogen-free Extract.

Nitrogen-free extract is a term including all those substances soluble in dilute hydrochloric acid. It includes mainly starches, sugar, and some gums. It is sometimes called "carbo-hydrate," although carbo-hydrates, strictly speaking, are substances containing carbon, hydrogen, and oxygen, the latter in the proportion to form water. Nitrogen-free extract does not include all the carbo-hydrates found in food; cellulose is not included, as it is insoluble in dilute hydrochloric acid, and is considered later as fibre.

Starch Group.

Starch is found widely distributed in plants as a reserve foodstuff, and exists in grains which are structurally characteristic of the species of plant producing them. It is scarcely found in coarse fodders. The grains are insoluble in cold water, but swell and burst with hot water

forming starch paste. Starch is converted by enzymes (diastase and ptyalin) into maltose and dextrine. Acids hydrolise starch to glucose and dextrine.

SUGAR GROUP.

This consists of (*a*) Grape sugar group—glucoses, (*b*) Cane sugar group—saccharoses.

Glucoses—Grape sugar is found in the juice of fruits and in the sap of plants.

Saccharoses—(1) Cane sugar found in sugar cane, grasses, beet-root and mangold.

(2) Malt sugar found in malted barley and germinated grains.

(3) Milk sugar found in milk and whey.

FUNCTIONS OF CARBO-HYDRATES.

Usually from 50-70% of the dry matter in stock foods consists of carbo-hydrates, which are usually described as the fuel portion of the food, or that part which goes to the production of heat and energy. They are transformed into other organic compounds and stored up in the animal body. Being readily oxidized, the energy produced by this process of slow combustion is used to perform work and maintain animal heat.

FAT—ETHER EXTRACT.

Fat is that part of a food that is soluble in ether. The term "fats" or "fats and oils" is technically incorrect, as the ether dissolves free fatty acids, wax, and chlorophyll, besides true fats, so that the ether extract is usually referred to as "crude fat."

The function of fats is to serve as a source of heat and energy as well as a source of animal fat, and as a source of heat fats are two and a quarter times more valuable than carbo-hydrates.

FIBRE.

Fibre is the tougher or woody portion of plants, consisting largely of cellulose. The proportion of fibre digested depends on the part and age of the plant, and also on the animal eating it. Fowls digest practically no fibre, except from young green plants in which the fibre is relatively easily digestible. Sometimes more energy is required for its digestion than the fibre itself can supply. The portion digested has the same uses as the carbo-hydrates.

ASH OR MINERAL INGREDIENTS.

These consist of the mineral residue left when the combustible part is burned off. In plant ash the principal ingredients are lime, phosphoric acid, and potash. Maize and the gluten compounds are deficient in lime salts, while bran is comparatively rich in phosphoric acid.

Ash supplies some of the necessary ingredients for bone formation, and assists in building up the tissues. The predominating salt in bones is lime phosphate, while that in flesh is potassium phosphate. Ash also supplies the essential substances in some of the digestive juices and in the blood. A ration that is balanced as far as feeding value is concerned is frequently deficient in mineral matter, in which case a supplementary mineral ration, supplying these deficiencies, must be available to the fowls.

Average Composition of Some Feeding Stuffs.

Foodstuff.	Water.	Protein.	Fat.	Carbo-hydrate.	Fibre.	Ash.
	%	%	%	%	%	%
SEEDS AND GRAIN—						
Wheat	11·0	10·5	2·0	72·9	2·0	1·6
Oats	13·3	10·3	4·8	58·6	9·9	3·1
Barley	14·0	9·0	1·8	68·0	4·0	2·2
Maize	13·0	9·5	4·0	69·3	2·8	1·4
Rice	12·6	6·7	0·4	78·0	1·5	0·8
Broom Corn ..	12·7	10·2	3·0	63·6	7·1	3·4
Peas	14·0	22·5	1·6	53·7	5·4	2·8
Sunflower ..	7·5	14·2	32·3	14·5	28·1	3·4
GREEN STUFF—						
Lucerne (green) ..	71·5	5·1	0·9	12·5	7·0	3·0
Lucerne (hay) ..	12·3	15·7	2·7	38·4	21·5	9·4
Grass Clippings ..	80·0	4·5	0·8	8·7	4·0	2·0
Rape	85·9	2·8	0·8	5·7	3·5	1·3
Cape Weed ..	93·2	1·2	0·3	3·0	1·1	1·2
Oats (green) ..	76·8	1·9	0·6	10·4	8·5	1·8
Barley (green) ..	79·0	2·7	0·6	8·0	7·9	1·8
Maize (green) ..	82·0	1·7	0·5	9·0	5·6	1·2
MILL PRODUCTS—						
Wheat Bran ..	11·3	15·0	4·5	54·4	8·0	4·8
Wheat Pollard ..	11·2	14·5	4·5	62·0	5·1	2·7
Ground Wheat ..	10·6	10·7	2·1	72·3	2·3	2·0
Ground Oats ..	9·1	9·3	6·4	61·0	9·2	5·0
Ground Barley ..	10·8	9·5	2·0	71·2	2·4	4·1
Pea Meal	12·6	23·3	1·5	53·8	6·4	2·4
Maize Meal ..	13·0	8·6	3·7	71·4	2·0	1·3
BY-PRODUCTS—						
Meat Meal ..	8·0	54·5	8·0	6·1	..	23·4
Dried Buttermilk ..	10·2	33·1	3·7	44·4	..	8·6
Bullock's Liver ..	76·2	5·8	2·5	..	.	1·2
Separated Milk ..	90·3	4·0	0·2	4·7	..	0·8
ROOTS—						
Onions	87.7	1·1	0·3	9·6	0·8	0·5
Potatoes	85·0	1·0	..	..	..	..
Mangels	87·4	1·0	0·1	9·8	0·8	0·9
EGGS	73·7	12·6	12·1	0·4	..	1·2

Various Poultry Foods.

GREEN FEED.

As green feed forms, or should form, a fair percentage of the birds' diet, it is necessary to maintain a continuous and varied supply. In Victoria it is possible to maintain this supply all the year round, though some difficulty may be found in the northern parts of the State during the hotter summer months. The lucerne plot is of the utmost value, as when ample water and manure are available there is an abundant supply of green feed that can be cut almost all the year round for a period of years. The next most important green feeds are rape, green oats, green barley, silver beet, and chou moullier. In the case of these plants the outer leaves should be pulled off and not cut. Lettuce is excellent for young chickens, but rather expensive to feed largely to adult fowls. Onions chopped up are a very fine tonic and good for the blood. Rape is generally sown

in the chicken rearing runs, and besides helping to sweeten the soil, is much relished by growing chickens. Suburban poultry keepers generally endeavour to secure the grass cuttings from nearby bowling greens.

Root crops, such as turnips or mangolds, are greedily eaten by laying fowls and may be fed whole, as the birds will pick all the inside out of them, leaving only the rind.

Animal Food.

Meat meal, blood meal, and rabbit meal supply a high proportion of protein in very concentrated form, but considerable care should be exercised in their use, as a constant over-supply will over-stimulate and so injure the egg organs. In addition there should be sufficient *bulk in the food to reasonably distend the digestive organs and so obtain* the best results from the digestive juices. These concentrated nitrogenous foodstuffs should be purchased on analysis, as at times a slightly cheaper preparation may contain such a low percentage of protein as to be in reality too dear to use.

Milk.

Excellent results have been obtained at the State Research Farm from the use of dried butter milk in place of meat meal. Skim milk can be used with advantage for mixing the mash, or it may be given to the birds to drink. If skim milk be available, it will mean a considerable saving on the cost of meat for the flock.

"Poultry Wheat."

A belief is prevalent (frequently amongst those who should know better) that much inferior, damaged, or smutty wheat will do for poultry. It will never "do" in the right meaning of the term. Next to seed wheat, only the best should be used, the feeding value of indifferent wheat making it dear at almost any price, whilst a light *weighing oat merely means buying a high proportion of indigestible* husk.

Dry versus Wet Mash.

The question is frequently raised whether the dry mash or wet mash system is the better. Each system has proved highly successful in the official egg laying competitions. In the test for teams of six birds a score of 1,667 was made one year in the wet mash section by Mr. J. H. Gill's team, whilst the following year Mr. W. N. O'Mullane's team in the dry mash section scored 1,699, which is the official record for a team of six Leghorns. As these scores were made in different years and by different breeders, it can hardly be claimed that they prove anything conclusive. In single test the 330 mark has been reached on both dry and also wet mash feeding by a White Leghorn and an Australorp.

Undoubtedly the dry mash system saves an enormous amount of labour, so that even if it were a fact that on a flock average the dry mash system gave a dozen eggs less per bird, it is probable that it would still be quite as profitable as the wet mash, maybe more so. But it has not been proved conclusively that a flock will lay more on wet mash. So far as the heavy breeds are concerned, there is with them a tendency to get over-fat on dry mash, particularly with big-framed, strong-constitutioned birds, though less robust birds, lacking spring of rib, have been observed to do well with dry mash.

The practice is to feed as much wet mash as will be eaten up by the birds in a period of about twenty minutes, whereas the dry mash is available all day long. The usual custom in Victoria is to feed grain at night and mash in the morning.

Feeding Poultry for Egg Production.

A simple variety of plain wholesome foods is all that is required for high egg production, and a selection may be made from the following:—

Bran, wheat pollard, oat pollard, maize meal, meat, meat meal, dried buttermilk, wheat, oats, maize, barley.

The following rations are suggested:—

WET MASH.

Bran, 30 lb.; wheat pollard, 50 lb.; oat pollard or maize meal, 10 lb.; meat meal or dried buttermilk, 10 lb.

If cooked meat, such as bullocks' or sheep's heads, livers, etc., is used in place of the meat meal or dried buttermilk, the mash is mixed with the soup, and approximately two ounces of the cooked meat is allowed per bird per week. Approximately 20% of chaffed green food is added.

DRY MASH.

Bran, 30 lb.; wheat pollard, 50 lb.; oat pollard or maize meal. 10 lb.; meat meal or dried buttermilk, 10 lb.

GRAIN.

Fed with either wet or dry mash.

Wheat, 60 lb.; oats, 20 lb.; maize, 20 lb.

One-half to one per cent. of table salt may be added to either the wet or dry mash.

GREEN FOODS.

Silver beet, rape, mustard, lucerne, berseem, oats, barley, maize, millet, rye grass, chou moullier, cabbage and cauliflower leaves.

These should be fed in a succulent condition. The usual custom is to feed green food at midday, but it is also advisable to feed it after the grain at night.

Granulated charcoal and shell grit should always be available.

Minced raw onions are a splendid tonic, given once a week.

A liberal supply of pure cool drinking water should be kept constantly before the birds.

Poultry for egg production should be given as much food as they will eat without waste. Strict cleanliness in the use of food and water vessels is essential if the birds are to be kept in perfect health.

VI.—FEEDING EXPERIMENTS.

Test No. 1.—Value of Various Cereals.

The following feeding experiment was conducted at the Werribee Research Farm, starting on 1st April, 1921 and concluding on 31st March, 1922. *One hundred and twenty* pullets were divided into four pens of thirty birds each, as nearly equal in quality, age, and weight as possible. None of the best matings were included, as these were required for either single test pens, or *bonâ fide* settlers.

All four groups were fed wet mash in the morning, and green stuff at mid-day, but each group was fed differently as regards the grain at night, the object of the experiment being *to test the economic importance*

of the various cereals used on flocks of comparatively moderate quality pullets such as would be found on any average farm, and not to establish high records from specially selected birds.

Pen No. 1 was fed Algerian oats (*not* clipped).

Pen No. 2 was fed wheat.

Pen No. 3 was fed barley.

Pen No. 4 was fed mixed grains (2 wheat, 1 oats, 1 barley).

The wet mash was made up of equal parts by measure—bran, pollard, and green stuff. The bran was moistened with soup made from boiled table scraps, sheep's head, livers, &c., or else meat meal, and dried off with pollard to a nice crumbly condition when the green stuff was added.

During the months of April, May, and June no bran was available, so ground wheat and ground barley in equal quantities were used in place of bran in the morning mash.

The green stuff used was lucerne, green barley, rye grass, and outer leaves of vegetables cut fresh and put through the chaff-cutter.

Minced raw onions were fed once a week at the rate of 1½ lb. per 100 birds. Epsom salts and sulphur were used occasionally.

Housing.

The birds were housed in a corrugated iron shed, divided into four pens, each containing about 160 square feet of floor space, being slightly over 5 square feet of floor space per bird.

The floor was kept covered with litter 4 to 6 inches deep, and no outside run was made available.

A dust bath was provided, whilst shell grit and charcoal were always available. Dropping boards were provided underneath the perches.

Health.

Unfortunately the mortality was high, as 10 died in No. 1 pen, 8 in No. 2 pen, 9 in No. 3 pen, and 6 in No. 4 pen. Sixteen of these died from unknown causes; *post mortems* were held on the farm and one bird was sent to the Veterinary Research Institute, without definite results, although it is more than likely that—indirectly—rats were the cause, by contaminating the drinking water. Early in December a raid was made, and 182 rats were thereby killed. After that no deaths occurred. Heat caused the death of 6 birds on 18th November, 3 were crop-bound, 6 died from ovary troubles, and 2 from accidents.

Summary.

Egg Yield and Feed Cost.

—	Average eggs per bird.	Average price per dozen eggs.	Return per bird.	Cost of Feed.			Profit over feed.
				Mash.	Grain.	Total.	
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Pen 1 (Oats) ..	170	1 8	23 7½	3 1½	3 9½	= 6 11	16 8
Pen 2 (Wheat)	150½	1 8	20 10½	2 8½	6 7½	= 9 4½	11 6½
Pen 3 (Barley)..	144½	1 8½	20 9½	2 7½	3 3½	= 5 10½	14 10½
Pen 4 (Mixed) ..	157½	1 7½	21 1½	2 5½	4 6½	= 7 0½	14 1½

It will be seen from above that the Algerian oat fed pen showed the best score, as well as the greatest profit per bird.

Weight of Birds.

At the commencement of the test the pullets averaged 2 lb. 12 oz.

At the conclusion of the test the No. 1 pen averaged 3 lb. 4 4-5 oz.; No. 2 pen, 3 lb. 9¾ oz.; No. 3 pen, 3 lb. 10 oz.; No. 4 pen, 3 lb. 8¾ oz.

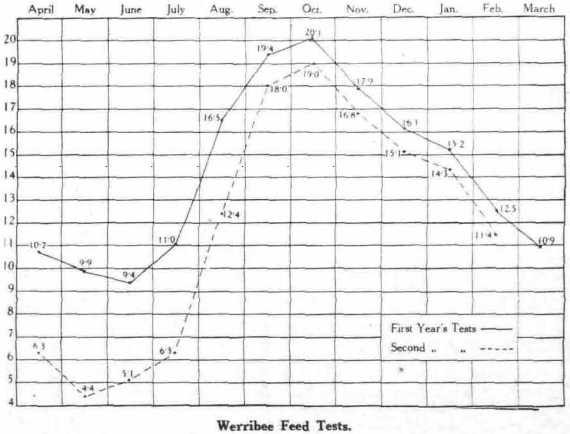
The oat fed pen showed the least gain in weight, and the others were more or less equal, with a fractional margin of increase in favour of the barley pen.

Food Prices (1921-22).

Wheat, 60 lb. bushel—1st April to 31st January, 9s. per bushel; 1st February to 31st March, 5s. per bushel.

Oats, 40 lb. bushel—All the year, 3s. per bushel.

Barley, 50 lb. bushel—1st April to 31st December, 3s. 6d. per bushel; 1st January to 31st March, 3s. 3d. per bushel.



Werribee Feed Tests.

Graph showing (*a*) average monthly yield per bird (3,716 pullets) for twelve years, 1922–1933; (*b*) average monthly yield per bird (640 second-year hens) for three years, 1927, 1929, and 1931.

Bran and pollard—£6 10s. per ton throughout the year.

Crushed wheat, 60 lb. bushel—April, May, and June, 9s. 4d. per bushel.

Crushed barley, 50 lb. bushel—April, May, and June, 3s. 10d. per bushel.

No charge was made for green stuff or meat scraps.

CONCLUSIONS TO BE DRAWN.

It may reasonably be concluded that Algerian oats is a thoroughly satisfactory feed, and should be more generally used than is the case at present. As was anticipated, barley gave the poorest egg yield, but the birds so fed laid well at the time of the year when eggs were dearest. Barley might, therefore, be fed with advantage during the winter months.

Test No. 2.—Free Choice.

An experiment to test the advisability of allowing birds free access to food at all times as compared with the ordinary practice of feeding at regular intervals, was conducted at the State Reseach Farm, Werribee, during the twelve months ended the 31st March.

Seventy-two White Leghorn pullets, each of quality about equal to that of an ordinary farm flock (none of the birds chosen was from a single mating) were divided into two lots of 36 each, and each pen was given food of the same ingredient throughout the year.

FOOD USED.

The birds in both pens were given dry mash in hoppers which were open at all times. This mash consisted of—bran and pollard, equal quantities by measure; meat meal, 10 lb. to every 100 lb. of bran and pollard, and about 3 per cent. powdered charcoal. In addition, a grain mixture of three parts Algerian oats to two parts wheat was fed to each pen.

To No. 1 pen the grain was fed in a hopper always open, and the birds were allowed green stuff, whole not chaffed, from a wire basket which was kept well supplied.

The birds in No. 2 pen had their grain scattered in the litter and chaffed green stuff was fed them at mid-day.

In order that the results might approximate to those that would have been obtained had the experiment been conducted on an ordinary farm, no other feed than that mentioned, which is obtainable almost anywhere in the State, was given the birds. A variety would have been greatly relished by them, and would probably have increased the egg-production, but as oaten pollard, barley, pollard pea-meal, bullocks' livers, &c., are not easily procurable by a large number of settlers at a distance from the metropolis, none of these was fed to the birds.

The green stuff used was green barley, rye grass, and rape during the winter months, and lucerne all the summer. Minced raw onions were fed once a week—about three-quarters of a lb. to each pen. Epsom salts and sulphur were used when thought advisable. Shell grit and granulated charcoal were always available, and a dust bath was provided in each pen.

HOUSING.

The birds were housed in a corrugated iron shed facing east. Each pen had a floor space of about 260 square feet—a little over seven square feet to the bird—and they were kept in the pen throughout the test, no outside run being made available. The floor was covered with from 4 to 6 inches of litter. Dropping boards were used underneath the perches.

Health of the Birds.

The general health of the birds was good throughout the test.

In No. 1 pen (continuous feeding) one bird became blind, and two went light; these three were destroyed.

In No. 2 pen one bird was found dead, one died from crop trouble, and one contracted disease and was destroyed.

Summary.

Egg Yield and Feed Cost (12 Months).

—	Average number of eggs per bird.	Value of eggs.	Food consumed per bird.	Cost of food.	Profit over cost of food.
		£ s. d.	lb.	s. d.	s. d.
Pen 1. Continuous feed ..	179	1 4 7	73·1	7 9	16 10
Pen 2. *Regular feeding* ..	164	1 1 8	80·6	8 5	13 3

It will be seen that the birds in No. 1 pen which had their food before them continuously throughout the twelve months, produced the largest number of eggs and showed the highest profit per bird. They made their greatest gain during the winter four months, April 1st to July 31st, the time at which eggs bring the highest price in Victoria.

During this period they cost a little over 4d per bird more for feed, but returned about 2s 3d per head in value of eggs as shown in the following table.

Egg Production and Feed Cost, 1st April to 31st July.

Pen.	No. of Eggs.	Value.	Cost of Feed.		Total.	Profit over Feed.
			Mash.	Grain.		
		£ s. d.			£ s. d.	£ s. d.
No. 1. Continuous	1,756	17 13 2½	(318 lbs.) £1 11 3	(795 lbs.) £4 0 4½	5 11 7½	12 1 7½
No. 2 Regular ..	1,368	13 1 3	(330 lbs.) £1 12 6	(670 lbs.) £3 7 9	5 0 3	8 1 0

One of the conclusions to be drawn is that pullets when starting to lay require more food than is usually given to them in early winter, as although the birds in No. 2 pen had a dry mash hopper always open and as much grain in the evening as they would pick up, those in No. 1 pen where food was always available consumed 113 lbs. more mash and grain for the four months.

The amount of green feed was not weighed. It was noted that the birds in No. 1 pen consumed the greater quantity of this—a considerable amount of it just before going to roost—and although their basket was kept well supplied with fresh green-stuff (whole) every day, they would eat almost as much chaffed green-stuff at mid-day as the members of No. 2 pen which were given as much as they would pick up.

It is reasonable to conclude that this green-stuff taken by the birds in No 1 pen the last thing at night, on an almost full crop of mash and grain, was an aid to digestion, and probably was an important factor in the higher egg-production.

FOOD PRICES.

As most of the food used was grown on the farm, and the balance purchased in large quantities at wholesale rates, it was considered advisable to calculate cost of food on prices which were supplied by one of the leading poultry-farmers in the State; they were as follow:—bran 1s. 10d. per bushel; pollard 1s. 10d. per bushel; oats 4s. per bushel; wheat 6s. 2d. per bushel.

Meat meal cost 2d. per lb.

Green-stuff was not taken into consideration.

Maize Feeding.

It is the opinion of a number of people who keep poultry, that maize can be fed with safety only in the winter months, and that it is dangerous, or at least harmful to use it in summer.

To test the effect of feeding a high percentage of maize throughout the year, 36 birds of equal quality to those used in the above-mentioned experiment were housed in the same building and treated in an exactly similar manner except for the feed ration. This test, too, was for a period of twelve months. The birds in the pen were fed on dry mash, in hoppers always open. The mash was composed of maize meal, bran, and pollard, equal quantities by weight, to every 100 lb. of which was added 10 lb. of meat meal, and 3 lb. of charcoal (powdered).

The grain ration, which was scattered in the litter, consisted of three parts crushed maize and one of wheat. Chaffed green stuff was fed at mid-day. There were three deaths; one bird went light and was destroyed in October; one was found dead in December; and one died of crop trouble in January. None of the complaints in these cases could be attributed to the maize. Otherwise the health of the birds was good throughout the year.

SUMMARY.

EGG YIELD AND FEED COST (12 MONTHS).

——	Average number of eggs per bird.	Value of eggs.	Food consumed per bird.	Cost of food.	Profit over cost of food.
		£ *s.* *d.*	lb.	*s.* *d.*	*s.* *d.*
Pen 3. Maize Feeding ..	156	1 1 4	80·8	8 10	12 6

The result of this experiment tends to show that maize fed in conjunction with other foods can be used with safety at all seasons of the year.

As maize is now being grown in larger quantities each year in many parts of the State it is probable that it will prove economical as a grain food in those districts where it can be procured at a reasonable price.

The fact that these birds did not suffer in any way is indicated by their egg-production for the last two months of the test. A reference

to the table of egg-production of the several pens shows that the maize-fed pen produced, during the months of February and March, five and a half dozen eggs more than the No. 1 pen (continuous feed), and seven and three-quarter dozen eggs more than No. 2 pen (regular feed).

Test No. 3.—Free Choice.

Some time since, an experiment was carried out to test the advisability of allowing White Leghorns a free choice of the various foods—usually fed to birds for egg production, as compared with two other systems of feeding in operation at the State Research Farm, namely—

(*a*) Dry mash kept in hoppers always available, chaffed green stuff given at mid-day and grain fed at night in the litter.

(*b*) Wet mash fed in troughs in the morning, chaffed green stuff at mid-day and grain fed in the litter at night.

The test commenced on 1st April, 1923 and concluded on 24th March, 1924—a period of 51 weeks. One hundred and eight White Leghorn pullets were divided into three lots of 36 birds, and each lot was in quality about equal to an ordinary farm flock. None of the birds used was bred from single-mated hens. The pullets were bred from pens of hens mated to selected cockerels and the progeny of each cockerel was toe-marked.

Care was taken that the same number of daughters of each male bird used in the breeding pens was placed in each of the experimental pens and every effort was made in the selection of the pullets to have the three pens as even as possible, in age, size, quality and breeding.

Weight of the Birds.

At the commencement of the Test the 108 pullets weighed 337½ lb., an average of 3 lb. 2 oz. per bird, and their average weight at the end of four months and at the conclusion of the Test is shown in the following Table:—

Date.	*No. 1.—Free Choice.*		*No. 2.—Dry Mash.*		*No. 3.—Wet Mash.*	
	No. of Birds.	Weight.	No. of Birds.	Weight.	No. of Birds.	Weight.
		lb. oz.		lb. oz.		lb. oz.
1st April	36	3 1	36	3 3	36	3 2
2nd August ..	36	3 11½	36	3 10	36	3 9
24th March ..	36	3 6½	36	3 7	36	3 7½

System of Feeding.

No. 1. Free Choice Pen. All the different varieties of food were placed in separate hoppers which were vermin- and sparrow-proof. The foods were as follow:—Bran, wheaten pollard, oaten pollard, barley pollard, meat meal, rape seed meal, wheat, Algerian oats (not clipped) cracked maize and barley. Green stuff was always available in a wire-netting basket; it consisted of green oats, green barley, rape, rye grass in winter, and lucerne in the summer. It was cut fresh every day and placed in the basket whole, not chaffed.

No. 2. Dry Mash Pen. The dry mash consisted of equal parts by measure of bran and wheat pollard; to every 100 lb. of meal was

added 10 lb. of meat meal, 3 lb. of powdered charcoal and 5 lb of rape seed meal. This mash was always available. Chaffed green stuff was fed at mid-day and the evening meal of grain consisting of wheat, oats, cracked maize, and barley was scattered in the scratching litter.

No. 3. Wet Mash Pen. The wet mash consisted of bran, wheat, pollard and chaffed green stuff, equal parts by measure, and was mixed as follows:—The bran was saturated with soup made from boiled livers, it was then dried off with pollard to a nice, crumbly condition, and the chaffed green stuff was added and thoroughly mixed through it. The birds were given as much as they would eat. Chaffed green stuff was fed at mid-day and the evening feed of grain, consisting of wheat, Algerian oats, cracked maize and barley was scattered in the litter Minced raw onions were fed to each pen once a week at the rate of 1 lb. per pen. Shell grit and granulated charcoal were always available

Housing.

The birds were housed in portion of a corrugated iron shed 120 ft by 20 ft., 9 ft. high in front and 7ft. at the back. The shed faces east, and the north, west, and south walls were wind-proof. Windows were provided along the west wall for ventilation. The east side was closed in 2 feet up from the floor, and 1 foot down from the roof; the rest was wire-netted and no curtains were used. A portion of this shed was partitioned off with wire-netting and divided into three pens of equal size about 260 sq. feet—a little over 7 sq. feet to the bird. The birds were kept in the pens throughout the test. The floor was covered with litter to the depth of about 4 inches. Dropping boards were used under the perches and dust baths were provided.

Health of the Birds.

The health of the birds was good throughout the test; there was no noticeable difference in any pen.

Monthly Consumption of Food.

Month.	Bran.	Pollard.	Oaten Pollard	Barley Pollard	Meat Meal.	Meal Rape.	Oats.	Wheat.	Barley.	Maize.	Eggs Laid.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
No. 1 Pen (36 Birds) Free Choice.											
April ..	12	25	½	½	..	..	41½	72	24½	17	419
May ..	13½	20	½	½	..	..	32½	96½	21½	26½	329
June ..	11½	9½	½	2	2½	..	48	54	14	37½	292
July .	12½	10½	3½	..	11½	..	22½	98	11½	51½	434
August ..	14½	9½	9	1	8	2½	30½	96½	24½	25½	669
September	16½	16½	12½	3	5½	1	41½	108½	25½	32½	700
October ..	22½	19½	17½	1½	8	1½	50½	103½	14	27	743
November..	21½	29½	2½	½	8½	..	57½	90	26	30½	723
December ..	20½	25	2½	½	5½	2½	32	91½	20	24½	613
January ..	18½	29	1½	2½	13½	2½	32	85	26	29½	554
February .	11½	19½	5½	3	3	1	63½	92	12	27½	449
March, 24th	8	15	7	2¾	1½	½	24½	70	19	26½	326
	184½	229	63	18½	67½	11½	475¾	1,058	238½	357½	6,251

SUMMARY.

Egg Yield and Feed Cost (51 Weeks).

	Average number of eggs per bird.	Value of eggs.	*Food* consumed per bird.	Cost of food.	*Profit* over cost of food.
		£ *s.* *d.*	lb.	*s.* *d.*	*s.* *d.*
Pen 1. Free Choice ..	173·64	1 1 6½	75	6 4	15 2¾
Pen 2. Dry Mash ..	169·47	1 0 6½	78·4	6 3	14 3½
Pen 3. Wet Mash ..	180·64	1 2 4¾	75·6	6 1¾	16 3

Conclusions from Free Choice Test (No. 3).

The results obtained in this experiment with the No. 1 Pen (Free Choice) indicate that White Leghorns can be trusted to balance their own ration and produce eggs economically.

Although they laid seven eggs per bird less, and cost 2¼d. per bird more to feed for the twelve months than the pen fed on the wet mash, it must be remembered that there was a considerable saving in labour in the feeding of the No. 1 Pen, as the feed hoppers had to be replenished on an average only twice a month; whereas, the wet mash for No. 3 Pen had to be prepared and fed to the birds every morning, and the grain mixed and fed to them every evening.

A reference to the table showing the monthly food consumption should be sufficient to break down the prejudice existing amongst a number of poultry-keepers against the use of Algerian oats. The oats used in this experiment was only fair average quality feed oats, straight from the harvester, not clipped or graded; yet the birds in No. 1 (Free Choice) Pen ate more of them than of either maize or barley.

It was very noticeable during the test that the quantity of maize consumed varied with the weather. The highest consumption for the year was in July, which was the coldest and wettest month of the test.

Rape seed meal was not placed in the pen till 1st August. From that date till the end of the test, there was only one month in which they did not eat some of it. This meal is readily eaten by the birds when placed in the dry mash.

The fact that the birds in No. 1 Pen (Free Choice) consumed 1,556 lb. more grain than mash may be accounted for by the cold weather during the winter and by the very mild summer.

It was noted that the No. 1 Pen (Free Choice) consumed a much larger quantity of green stuff than either of the other two pens, and a considerable portion of it was eaten the last thing before the birds went to roost. In view of this fact, it was decided to feed green stuff after the grain feed at night to all the birds at the Research Farm, and this has resulted in a great improvement in the number of eggs laid.

Test No. 4.—Free Choice *v.* Wet Mash (Australorps).

After the publication of the results of the Free Choice Experiment conducted with White Leghorns, it was the opinion of many poultrymen, that although White Leghorns gave satisfactory results under that system of feeding, it would not be advisable to allow Autralorps free access to food at all times, owing to the fact that they are a less active breed, and it was suggested that if they did not have to scratch and search for their food they would not take sufficient exercise, and therefore would become too fat to lay a payable quantity of eggs.

To ascertain if there were any grounds for this supposition, a feeding experiment extending over twelve months was conducted at the State Research Farm, Werribee, concluding on 31st March, 1925. As a check, another pen was fed wet mash. One hundred and twenty Australorp pullets were selected, in quality about equal to an ordinary farm flock, and were divided into two pens of 60 birds each. None of the pullets was bred from single-mated hens, but all were from pens of hens mated to selected cockerels, and the progeny of each cockerel had been toe-marked. Care was taken that an equal number of daughters of each of the male birds used in the breeding-pens was placed in each of the experimental pens. Every effort was made in the selection of the pullets to have the two pens as even as possible in age, size, quality, and breeding.

At the commencement of the test the pullets were weighed; No. 1 pen—free choice—weighed 248½ lb., and No. 2 pen—wet mash—242½ lb.

System of Feeding.

No. 1 Pen—Free Choice.

All the different varieties of food were placed in separate hoppers, which were vermin- and sparrow-proof.

The foods were—wheat, oats, maize, barley, wheat pollard, oat pollard, barley pollard, bran, meat meal, and rape seed meal. Green stuff was always available in a wire-netting basket; it consisted of green oats, green barley, rape, milk thistles, and rye grass in winter, and lucerne in the summer; it was cut fresh every day, and placed in the basket not chaffed.

No. 2 Pen—Wet Mash.

The wet mash consisted of wheat pollard, bran, and chaffed green stuff—equal parts by measure—and was mixed as follows:—The bran was saturated with soup made from boiled livers; it was dried off with pollard to a nice crumbly condition, and the chaffed green stuff was then added and thoroughly mixed through it. The birds were given as much as they could eat. Chaffed green stuff was fed at midday, and the evening feed of grain consisted of wheat, Algerian oats, cracked maize and barley scattered in the litter. Chaffed green stuff was again fed after the grain feed at night. Shell grit and granulated charcoal were always available.

Housing.

The birds were housed in an open-fronted corrugated iron facing the east; a little over 4 square feet of floor space was al to each bird. The floor was kept covered with from 4 to 6 incl straw. Dust baths were provided and dropping boards were under the perches.

Health of the Birds.

The health of the birds in each pen was equally good throu the test.

Summary.

Egg Yield and Feed Cost (12 Months).

—	Average number of eggs per bird.	Value of eggs.	Food consumed per bird.	Cost of food.	P ove of
		£ s. d.	lb.	s. d.	s.
Pen. 1. Free Choice ..	172·06	1 4 10	85·8	7 3¾	17
Pen 2. Wet Mash ..	161·73	1 2 1	86·5	7 3¾	14

The birds were weighed four times during the test, and the and weights are shown in the following table:—

Weight of Birds.

Date.	No. 1 Free Choice.		No. 2 Wet Mash.	
	Number of birds.	Weight.	Number of birds.	Weigl
		lb.		lb.
1st April	60	248½	60	242
1st August ..	60	298	60	301
1st December ..	60	285½	60	285
31st March ..	60	289	60	288

It will be noted that the Wet Mash pen gained in weight t extent of 45½ lb. in the twelve months, whereas the Free Choice gained only 40½ lb. in spite of the fact that the birds had free acc all the food hoppers at any time during the test.

The table of the amount of the different grains consumed b Free Choice pen shows that, next to wheat, oats was the grain favoured by the birds, and although they had the choice of all other grains at all times, they ate 874 lb. of oats.

The oats used was of only fair average quality, straight off the vester, and was not clipped or graded. This grain can alway bought at a much cheaper rate than wheat. Its value as a po food has been demonstrated by feed tests at the Research Farm du several years, yet poultrymen desiring to produce eggs economi do not use oats to the extent they should.

RESULTS.

Pen No. 1—Free Choice.—60 Australorps.

Month.	Food Consumed.												Eggs Laid.	
	Wheat.	Oats.	Maize.	Barley.	Wheat Pollard.	Oat Pollard.	Barley Pollard.	Bran.	Meat Meal.	Rape Meal.	Total.	Cost.	Number.	Value.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	£ s. d.		£ s. d.
April ..	157	123	64	38½	15½	5½	11	13½	4	4	436	1 14 7½	563	6 1 2
May ..	111	97	67	50½	27½	15½	15	23	5	5½	417	1 13 9¾	835	9 18 7
June ..	122½	61	61	34½	31	11½	28	17	5½	8½	380½	1 11 9¾	956	9 17 6
July ..	139½	56	72	54½	32	16	48	29	3½	4½	455	1 17 9¼	922	7 4 0
August ..	108½	102	65	40½	36	15½	57	35	5	5	469½	2 0 10¼	948	5 5 4
September	84½	72	71	49	39	13	59	39½	3	8	438	1 17 3¼	1,018	5 0 8
October	83	48	73	100	42	8	64½	44	3	1	460½	1 17 8½	1,039	5 2 9
November	75	80	59	68	45	10	58½	55	4	..	454½	1 17 4¼	986	5 13 0
December	92	84	68	53	39	7	31	42	4½	..	420½	1 15 1½	891	5 8 3
January	95	62	62½	65½	40	11½	21	49	3	..	409½	1 16 3¼	815	4 16 2
February	107	52	48½	53½	37	6½	30	47	3	..	384½	1 14 3¼	657	4 11 3
March ..	175	37	15	74½	34	21	11	43½	6½	..	417½	2 2 1¼	694	5 15 8
	1,350	874	726	682	418	141	434	437½	50	36½	5,149	21 18 11¾	10,324	74 14 4

Test No. 5.—Dried Butter-milk *v.* Meat Meal (White Leghorns).

There is a great difference of opinion amongst poultrymen as to the value of meat meal over dried butter-milk for the production of eggs. To test the merits of the two, an experiment was conducted at the Research Farm, Werribee, during the twelve months from 1st April, 1924, to 31st March, 1925. One hundred and twenty White Leghorn pullets (none of them bred from single matings, but from pens of hens mated to pedigree cocks) nearly equal in age, quality, size, and weight were chosen for the experiment.

The toe marks indicated from what cock the pullets had been bred, and to eliminate as far as possible the chance of there being in any pen an undue proportion of birds bred from parents of the best egg-producing strain, the pullets were all examined, and where there were four birds from the same cock, two were placed in one pen and two in the other, and so on.

The weights of the birds on the first day of the test were as follows:—No. 3 pen, dried milk, 187 lb. (60 birds); No. 4 pen, meat meal, 188 lb. (60 birds).

Housing.

The birds were housed in an open-fronted corrugated iron shed facing the east. They were kept in the shed throughout the test, no outside run being made available. The floor space allowed was a little over 4 square feet per bird, and the floor was kept covered with from 4 to 6 inches of straw. Dust baths were provided and dropping boards were used underneath the perches.

System of Feeding.

Dry mash in hoppers was available to both pens at all times; chaffed green stuff was fed at midday and mixed grain at night; chaffed green stuff was also fed after the grain food at night. Both teams were housed, treated, and fed exactly the same, with the exception that to the dry mash fed to Pen 3, 10 per cent. dried milk was added. To the dry mash of Pen No. 4, 10 per cent. meat meal was added instead of the dried milk.

The mash fed to both pens consisted of equal parts of bran and pollard by measure and 3 per cent. powdered charcoal.

The green stuff was green oats, green barley, rye grass, milk thistles, and lucerne. The grains fed were wheat, oats, maize, and barley.

The dried butter-milk and meat meal used in the test were found to contain—

	Meat Meal.	Dried Butter Milk.
	%	%
Moisture	7·92	6·55
Ash	5·89	6·17
Protein	56·69	21·19
Crude Fibre	5·58	1·04
Nitrogen—		
Free Extract	3·55	4·92
Ether Extract	20·37	20·13

HEALTH OF THE BIRDS.

The general health of the birds was good throughout the test, and although No. 3 Pen (dried butter-milk) laid over 2,000 eggs more than the other (meat meal) there was not during the whole twelve months of the test anything in the appearance of the birds in the two pens to suggest that one lot was laying so much better than the other.

SUMMARY.

Egg Yield and Feed Cost (12 Months).

	Average number of eggs per bird.	Value of eggs.	Food consumed per bird.	Cost of food.	Profit over cost of food.
		£ s. d.	lb.	s. d.	£ s. d.
Pen 3. Dry Mash—Butter-milk ..	211·46	1 9 7½	91	7 11½	1 1 8
Pen 4. Dry Mash—Meat Meal ..	174·73	1 4 0	83	7 0½	0 16 11½

It was noted that the pen fed on dried butter-milk consumed 430 lb. more mash than that fed on meat meal; this was probably due to the fact that the milk made the mash more palatable. The birds of the former pen also ate 41 lb. more grain. The total cost of the extra food amounted to £2 15s. 1d., but as the milk-fed pen returned £16 14s. 6d. more for eggs, it must be considered a highly satisfactory result.

The birds were weighed at intervals during the test. The weights were as follow:—

Date.	Pen No. 3—Milk Fed.		Pen No. 4—Meat Meal Fed.	
	Number of birds.	Weight.	Number of birds.	Weight.
1st April	60	187	60	188
1st August ..	60	224	60	225½
1st December ..	60	209	60	197
1st March ..	60	212	60	203

Test No. 6.—Dried Butter-milk *v.* Meat Meal.

A TWO YEARS' TRIAL (1925-1927).

In a dry-mash trial with White Leghorns, the pen of birds in whose feed dried butter-milk was included gave so very much better results than the pen to which meat meal was fed, that an experiment was arranged so as to put these two foods to a more conclusive trial. It was decided that the test should extend over two laying seasons so as to ascertain if the results of the first year would be maintained in the second year, and also to determine whether one food could be regarded as superior to the other in its effect on the birds during the moulting season.

TABLE I.—DRIED MILK TEST 1925-27, WITH AUSTRALORPS.

(60 Birds.)

FED UNDER FREE CHOICE SYSTEM.

Date.	Bran.	Pollard.	Dried Butter-milk.	Wheat.	Oats.	Maize.	Barley.	Eggs.	Price per Dozen.	Value.
									s. d.	£ *s. d*
1925–26 SEASON.										
1925.										
May ..	9	7½	31½	185	110½	65	35	590	2 6½	6 4 11
June ..	1	8½	30	128	76½	53	51	825	2 3	7 14 8
July ..	14	9	40	115	70½	79	64	841	1 7	5 10 11
August ..	11	15	36	143	42	76	46	1,000	1 4½	5 14 7
Sept. ..	16	22	43	161	65	62	52	1,403	1 2½	5 15 1
Oct. ..	19	19	38	96	86	77	65	1,190	1 1½	5 11 7
Nov. ..	6	35	22½	158	51	62	20	964	1 2	4 13 9
Dec. ..	24	21	38½	76	37	49	77	812	1 4	4 10 3
1926.										
Jan. ..	25	29	37	170	56	50	60	907	1 3½	4 17 7
Feb. ..	22	16	36	109	76	67	65	814	1 7	5 7 5
March ..	19	11	36	85	89	84	51	908	1 9	6 12 5
Totals	166	193	388½	1,426	759½	724	586	9,994	..	62 13 2
1926–27 SEASON.										
April ..	15	24	15	126	59	61	43	526	2 5	5 5 11
May ..	21	28	10	110	68	100	38	441	2 7	4 14 11
June ..	23	30	7	194	71	29	39	407	2 5	4 2 0
July ..	16	20	9	159	100	91	25	458	1 7	3 0 5
August ..	16	23	15	151	93	58	36	674	1 7	4 8 11
Sept. ..	29	24	33	110	107	18	52	875	1 2	4 5 1
Oct. ..	25	21	34	138	46	52	24	915	1 2	4 9 0
Nov. ..	21	8	39	95	56	65	49	754	1 3	3 18 6
Dec. ..	10	9	29	165	101	16	33	684	1 6	4 5 6
1927.										
Jan. ..	12	8	35	161	43	46	34	661	1 6	4 2 7
Feb. ..	13	8	40	102	68	50	22	553	1 11	4 8 4
Totals	201	203	266	1,511	812	586	395	6,948	..	47 1 2

TABLE II.—MEAT MEAL TEST 1925-27, WITH AUSTRALORPS.

(60 Birds.)

FED UNDER FREE CHOICE SYSTEM.

Date.	Bran.	Pollard.	Meat Meal.	Wheat.	Oats.	Maize.	Barley.	Eggs.	Price per Dozen.	Value.
									s. d.	£ *s. d.*
1925–26 SEASON.										
1925.										
May ..	32	10½	3	119	126	53	76	466	2 6½	4 18 8
June ..	21	17½	1½	79	100	74	107	762	2 3	7 2 10
July ..	28	13	3½	101	74	68	76	624	1 7	4 2 4
August ..	21	15	3	132	73	94	51	681	1 4½	3 18 0
Sept. ..	33	30	1	100	64	61	42	946	1 2½	4 15 3
Oct. ..	14	49	2½	91	98	72	39	943	1 1½	4 8 5
Nov. ..	30	39½	1½	115½	54	70½	31	809	1 2	3 18 8
Dec. ..	8	32½	2	87½	63	46½	42	685	1 4	3 16 1
1926.										
Jan. ..	59	33	1	110	57	61	71½	688	1 3½	3 14 1
Feb. ..	18	48	1	105	72	50	31½	661	1 7	4 7 2
March ..	39	36	3½	81	61	68	78	658	1 9	4 15 11
Totals	303	324	23½	1,121	842	718	645	7,923	..	49 17 5
1926–27 SEASON.										
April ..	23	20	6	103	60	75	39	464	2 5	4 13 5
May ..	28	15	4	86	58	98	52	446	2 7	4 16 0
June ..	26	32	2	156	93	28	31	334	2 5	3 7 3
July ..	19	33	..	143	69	120	36	321	1 7	2 2 4
August ..	21	22	1	130	80	111	37	805	1 7	5 6 2
Sept. ..	21	21	..	100	126	62	40	1,048	1 2	5 1 11
Oct. ..	22	22	..	68	46	84	58	1,181	1 2	5 14 10
Nov. ..	16	19	..	87	52	52	70	1,074	1 3	5 11 10
Dec. ..	21	24	..	115	93	28	52	990	1 6	6 3 9
1927.										
Jan. ..	18	25	..	117	67	63	32	999	1 6	6 4 10
Feb. ..	16½	26	..	67	99	63	36	697	1 11	5 11 4
Totals	231	259	13	1,172	843	784	483	8,359	..	54 13 8

TABLE III.—SUMMARY OF RESULTS.

Pen.	Average No. of Eggs Laid per Bird.	Return per Bird.	Average of Food Consumed per Bird.	Food Cost.	Profit over Cost of Food.
		£ s. d.	lb.	£ s. d.	£ s. d.
No. 1. DRIED BUTTER-MILK TEST.					
Australorps, Free Choice—					
First season (11 months) ..	166·56	1 0 10½	70·71	0 8 6½	0 12 4½
Second season (11 months) ..	115·8	0 15 8¼	66·23	0 7 7¾	0 8 0½
Total	282·36	1 16 6¾	136·94	0 16 2	1 0 4¾
No. 2. MEAT MEAL TEST.					
Australorps, Free Choice—					
First season (11 months) ..	132	0 16 7½	66·27	0 5 10¾	0 10 8¾
Second season (11 months) ..	139·3	0 18 2¾	63·08	0 5 11½	0 12 3½
Total	271·3	1 14 10¼	129·35	0 11 10¼	1 3 0
No. 3. DRIED MILK TEST.					
White Leghorns, Wet Mash—					
First season (11 months) ..	171·2	1 1 3	79·42	0 8 6½	0 12 8¾
Second season (11 months) ..	107·76	0 14 5¾	76·45	0 8 5½	0 6 0½
Total	278·96	1 15 8¾	155·87	0 16 11¾	0 18 9
No. 4. MEAT MEAL TEST.					
White Leghorns, Wet Mash—					
First season (11 months) ..	156·5	0 19 1½	79·97	0 7 7	0 11 6½
Second season (11 months) ..	128·53	0 16 4¾	76·45	0 7 5½	0 8 11½
Total	285·03	1 15 6	156·42	0 15 0½	1 0 5¾

TABLE IV.—LIVE WEIGHT RECORDS DURING PERIOD OF EXPERIMENTS.

(The weights given are the average for each pen on date of weighing.)

Date.	Pen No. 1.	Pen No. 2.	Pen No. 3.	Pen No. 4.
	Dried Milk, Australorps, Free Choice.	Meat Meal, Australorps, Free Choice.	Dried Milk, White Leghorn, Wet Mash.	Meat Meal, White Leghorn, Wet Mash.
1925.	lb.	lb.	lb.	lb.
1st May	3·83	3·91	3·11	3·13
30th October ..	4·58	4·43	3·5	3·53
1926.				
14th May	4·69	4·46	3·81	3·79
— August ..	5·38	5·18	4·31	4·41
— December ..	5·25	4·79	3·64	3·77
1927.				
28th February ..	5·06	4·69	3·69	3·81

For the experiment, two pens of Australorps and two pens of White Leghorns were selected. Both pens of Australorps were fed on the free choice system, and the only difference in the feed given them was that one pen was allowed dried milk, while in place of dried milk the other pen was fed meat meal. The several varieties of food were placed in different hoppers, and were available to the birds at all times. The hoppers are vermin- and sparrow-proof. Each variety of food was weighed and the actual consumption by the birds in each pen was recorded every month. The White Leghorns were fed wet mash, the only difference in their feeding being that one pen was given dried milk as portion of its feed, while the other was given meat meal instead of dried milk.

On page 72 is printed a table (I.) giving the quantities of the various foods consumed month by month during the full period of the test by the pen of Australorps in whose feed dried milk was included; in this table also is shown the number of eggs laid each month and their value. On the following page (Table II.) similar information is given regarding the pen in whose feed meat meal was included instead of dried milk.

COMMENTS ON EXPERIMENT.

Although the pens to which meat meal was fed showed a greater net profit than those to which dried milk was fed, it was very noticeable that the birds which were given milk laid much better than the others during the autumn and winter, and they certainly came through the moult very much easier.

The test showed that it would probably pay to feed dried milk to layers from about February to August, but during the spring and

summer months milk has little or no advantage over meat meal, a feed that is much cheaper.

The test also demonstrated that with reasonably good layers it pays handsomely to keep them for egg-production for two seasons. In the case of No. 2 Pen, the birds laid a greater number of eggs in the second season than in the first. Even if no greater number of eggs be laid, it would still be better to keep most birds for a second season. It must be remembered that a pullet does not start to lay until she is about six months old, and the cost of food for that period has to be deducted from the first season's profit. Further costs are those of incubating and brooding.

Test No. 7.—Various Feed Tests with White Leghorns.

A feeding test with six pens of pullets, 50 birds in each pen, was commenced on 1st May, 1926, and concluded on 12th March, 1927. The different systems of feeding were as follow:—

Pen.	Mash.	Green Stuff.	Grain.
No. 5 ..	Wet Mash (equal parts Bran and Pollard and 10 per cent. Meat Meal)	Fresh succulent green feed	Wheat, 67 per cent.; Barley, 33 per cent.
No. 6 ..	,, ,, ,,	,, ,,	Broom Corn and Mixed Grain
No. 7 ..	Wet Mash (equal parts Bran and Pollard and 10 per cent. Meat Meal; also 5 per cent. Superphosphate)	,, ,,	Wheat, 67 per cent.; Barley, 33 per cent.
No. 8 ..	Wet Mash (equal parts Bran and Pollard and 10 per cent. Meat Meal)	Soaked lucerne chaff	,, ,,
No. 9 ..	,, ,, ,,	Sprouted oats ..	,, ,,
No. 10 ..	,, ,, ,,	No greed feed ..	,, ,,

Housing.

In March, 1926, the big laying shed, which had previously been used for feeding tests, was remodelled and divided into pens approximately 11 feet wide and 20 feet deep, each to hold 50 birds. The perches were altered from the old dropping-board system to the manure-pit system, as shown on page 98.

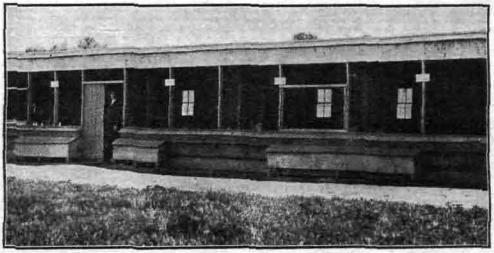
SUMMARY.

Egg Yield and Feed Cost (10½ Months).

—	Average Number of Eggs per Bird.	Value of Eggs.	Food Consumed per Bird.	Cost of Food.	Profit over Cost of Food.
		£ s. d.	lb.	s. d.	s. d.
Pen No. 5. Check Pen ..	161	1 1 6⅔	86·1	8 2⅔	13 4
Pen No. 6. Broom Corn ..	142	0 17 11½	84·2	9 0½	8 11
Pen No. 7. Superphosphate ..	140	0 18 0	83·7	7 11	10 1
Pen No. 8. Lucerne Chaff ..	148·5	0 18 10⅔	84·3	8 0½	10 10½
Pen No. 9. Sprouted Oats ..	137·5	0 17 8½	80·0	7 7½	10 1
Pen No. 10. No green Feed ..	140	0 18 0	85·5	8 2	9 10

HEALTH.

Forty birds died during the test—8 in pen 5, 2 in pen 6, 3 in pen 8, 5 in pen 9, and 22 in pen 10. All the birds in pen 7 survived. The high death rate in pen 10 was probably caused by the absence of green feed in the ration.



Front of Experimental Feed Shed, State Research Farm, Werribee.
The shed consists of 10 pens, each of which accommodates 50 birds.

CONCLUSIONS.

The value of green feed for laying pullets was clearly demonstrated. Soaked lucerne chaff and sprouted oats, although better than no green stuff, do not take the place of fresh, succulent green feed.

Broom corn as the sole grain food was not satisfactory. If, however, it be mixed with other grains (up to 50 per cent.) it will be found satisfactory, but would be economical only when the price is below that of other grains.

Superphosphate, when added to the mash, did not increase the egg production, but the birds to which it was fed kept in remarkably good health throughout the test, and no deaths were reported.

Test No. 8.—Various Feed Tests with White Leghorns.

A feeding test with ten pens of White Leghorn pullets, 50 birds in each pen, was commenced on 1st April, 1927, and concluded on 28th February, 1928. The different systems of feeding were as follow:—

Pen 1. Dry Mash	Mixed Grain.	
Pen 2. Wet and Dry Mash	,,	
Pen 3. Wet Mash plus 1 per cent Cod Liver Oil	,,	
Pen 4. Wet Mash plus 2 per cent. Cod Liver Oil	,,	
Pen 5. Wet Mash	,,	
Pen 6. ,,	Mixed Grain.	Shell Grit.
Pen 7. ,,	Mixed Grain.	Quartz Grit.
Pen 8. ,,	Mixed Grain.	Limestone.
Pen 9. ,,	Mixed Grain.	Limestone and Shell Grit.
Pen 10. ,,	Mixed Grain.	No Grit or Shell.

Summary.

Egg Yield and Feed Cost (11 Months).

—	Average Number of Eggs per Bird.	Value of Eggs.	Food Consumed per Bird.	Cost of Food.	Profit over Cost of Food.
		£ s. d.	lb.	s. d.	s. d.
Pen 1. Dry Mash	165·3	1 3 1	76·2	7 0	16 1
Pen 2. Wet and Dry Mash	154·4	1 1 11	84·8	7 9	14 2
Pen 3. Cod Liver Oil 1 per cent.	129·5	0 18 4	87·5	8 0	10 4
Pen 4. Cod Liver Oil 2 per cent.	141·5	1 0 2	88·1	8 1	12 1
Pen 5. Control	134·1	0 18 11	87·4	8 0	10 11
Pen 6. Shell Grit	139·9	1 0 6	87·4	8 0	12 6
Pen 7. Quartz Grit	121·6	0 17 9	87·4	8 0	9 9
Pen 8. Limestone	129·7	0 18 6	87·4	8 0	10 6
Pen 9. Limestone and Shell	123·6	0 17 4	87·4	8 0	9 4
Pen 10. No Shell	121·9	0 17 3	87·4	8 0	9 3

Health.

A number of deaths occurred in all the pens (particularly pen 2) from peritonitis. These losses, of course, considerably affected the production. Several birds were sent to the University Veterinary School for post-mortem examination, but the cause of the trouble was not determined.

Conclusions.

Production was increased during the cold winter months by feeding both wet and dry mash. The addition of cold liver oil to the mash made no noticeable difference either in the appearance or the production of laying pullets.

The object of the test with pens 6 to 10 was to try to ascertain what influence shell grit, quartz grit, and limestone would have on the texture and thickness of the shells of eggs, also the effect on the birds

themselves. By close observation it was noticed that the birds in pens 7 and 10 were very discontented, and were craving for shell grit, which indicates that shell grit is necessary for birds kept in confinement, whether other grit or quartz is given or not. It is considered that shell grit not only helps in grinding the food, but it also provides certain minerals which the birds require. Eggs from each of the pens were examined and the shell accurately measured at intervals throughout the test. They were found to be normal, with only the usual fractional differences in the thickness of shells.

In pen 10 a large number of shell-less eggs were dropped from the perches, but the eggs laid in the nests had shells of normal thickness.

Test No. 9.—Effect of Minerals in Feed on Quality of Eggs and Thickness of Shells and other Feed Tests (White Leghorns).

During the year 1928-29 several experiments were carried out in the poultry section of the State Research Farm at Werribee. One of these was designed with a view to ascertaining whether by the addition of minerals to the feed the texture of the shells of eggs could be strengthened.

The number of eggs offered for export which has to be rejected is increasing each year. A very large percentage of these rejections is due to the shells being stained or dirty. For those who suffer on this account there need be little sympathy, for during the past few years warnings have been given by the Government graders, by exporters, and by departmental officers that, owing to the risk of mould, only eggs spotlessly clean in shell would be accepted for export. There is, however, unfortunately a growing number of rejections because of the shells, as well as because of a deficiency in internal quality, a deficiency due chiefly to enlarged air cells and weak albumen (watery whites).

Enlarged Air Cells and Weak Albumen.

Enlarged air cells usually indicate staleness, while watery whites are often caused by exposure to warm temperatures or to long storage. But at times eggs only a couple of days old show this fault.

Such defects as those mentioned are not peculiar to Victoria; they have been noticed also in the other States. In America and England they have become so common as to cause considerable loss to producers.

Although investigational work has been carried out in various parts of the world, no reason has yet been assigned for the troubles. Officers of the Victorian Department of Agriculture have been carrying on experiments which it was hoped would lead to a solution of the problems, but so far without success.

Thin Shells.

The experiment made at Werribee to try to determine whether the strength of the shell of eggs could be improved consisted of the addition of a mineral mixture (which contained potassium iodide) to the ordinary food. The mineral mixture was one suggested by Professor

Frank Ewart Corrie, B.Sc., and was made up of 50 lb. bone flour, 23 lb. ground lime, 20 lb. common salt, 5 lb. sulphur, 2 lb. oxide of iron, and 4 oz. potassium iodide.

The test was conducted for a period of eleven months from the 1st April, 1928, and the birds used were 300 White Leghorn pullets, as even as possible in quality, weight, and age. They were divided into six pens of 50 birds each, and were all kept under one roof and under similar conditions as to space. They were not allowed out, and so were unable to get any food except that fed to them. Pens 1, 2, 3, and 6 were fed dry mash in hoppers available at all times; grain was fed them in the litter in the evening; green stuff and shell grit were also given.

Pen No. 1 received 3 per cent. of the mineral mixture in the mash.

Pen No. 2 received 5 per cent. of the mineral mixture in the mash.

Pen No. 3 received ¾ oz. potassium iodide to 100 lb. mash.

Pen No. 6 received similar feed to Pens Nos. 1, 2, and 3, but was fed no mineral mixture.

Pen No. 4 was fed dry mash without grain or mineral.

Pen No. 5 was fed grain without mash or mineral.

The table on page 81 shows the average amount of food consumed per bird, the average egg production and the average weights of the birds on 1st April, 1928, and on 31st March, 1929.

Mr. H. F. Clinton measured a number of the shells of the eggs laid in these six pens, and has prepared the following report and tables:—

In determining shell thickness all measurements were made, without the shell membranes, on the medial or central portion of the shell. It was considered that the mean of a number of readings taken in this region would yield a figure suitable for comparative purposes.

The readings do not represent an absolute measure of the thickness of shell, owing to the fact that the diameter of the micrometer spindle was 2.5 mm., as well as to the curvature of the shells, with the consequence that the measurements are not quite so great as stated. This, however, may be taken as constant for all practical purposes, and for comparative work such as this, need not be taken into account—the error being approximately the same for every measurement carried out. It must be remembered that any measurements made will vary according to the diameter of the spindle or anvil of the micrometer used.

For convenience all measurements are given in millimetres. As 1 inch is equivalent to 25.4 millimetres the readings may be converted to inches by dividing by 25.4.

Examination of a large number of eggs in previous experiments, and measurements of them with the micrometer referred to, showed that eggs with shells of less than 0.32 millimetres (0.0126 inch) in thickness were too frail to be handled satisfactorily.

TABLE A.—MEASUREMENTS OF EGGS (THICKNESS OF SHELL).
(Made on 28th March, 1929.)

PEN NO. 1.—DRY MASH AND GRAIN.
3 per cent. Mineral Mixture.

0·32 mm.
0·375 ,,
0·38 ,,
0·31 ,,
0·37 ,,

PEN NO. 2.—DRY MASH AND GRAIN.
5 per cent. Mineral Mixture.

0·36 mm.
0·35 ,,
0·32 ,,
0·35 ,,
0·34 ,,

PEN NO. 3.—DRY MASH AND GRAIN.
Potassium Iodide.

0·345 mm.
0·36 ,,
0·31 ,,
0·37 ,,
0·34 ,,
0·35 ,,

PEN NO. 4.—DRY MASH ONLY.

0·31 mm.
0·31 ,,
0·34 ,,
0·35 ,,
0·345 ,,

PEN NO. 5.—GRAIN ONLY.

0·29 mm.
0·36 ,,
0·43 ,,
0·37 ,,
0·295 ,,
0·39 ,,

PEN NO. 6.—DRY MASH AND GRAIN.

0·36 mm.
0·30 ,,
0·36 ,,
0·35 ,,
0·35 ,,

TABLE B.—MEASUREMENTS OF EGGS (THICKNESS OF SHELL).
(Made on 21st June, 1929.)

PEN NO. 1.—DRY MASH AND GRAIN.
3 per cent. Mineral Mixture.

0·375 mm.
0·355 ,,
0·35 ,,
0·41 ,,
0·32 ,,
0·39 ,,

PEN NO. 2.—DRY MASH AND GRAIN.
5 per cent. Mineral Mixture.

0·365 mm.
0·33 ,,
0·325 ,,
0·33 ,,
0·315 ,,
0·345 ,,

PEN NO. 3.—DRY MASH AND GRAIN.
Potassium Iodide.

0·34 mm.
0·39 ,,
0·315 ,,
0·35 ,,
0·38 ,,
0·33 ,,

PEN NO. 4.—DRY MASH ONLY.

0·40 mm.
0·31 ,,
0·37 ,,
0·275 ,,
0·23 ,,

PEN NO. 5.—GRAIN ONLY.

0·99 mm.
0·415 ,,
0·38 ,,
0·325 ,,
0·40 ,,
0·42 ,,

PEN NO. 6.—DRY MASH AND GRAIN.

0·37 mm.
0·31 ,,
0·355 ,,
0·38 ,,
0·41 ,,
0·35 ,,

Other Feeding Experiments.

An experiment was made to test whether a greater number of eggs could be obtained from birds, if in addition to wet mash they were given dry mash as well. Two pens of Leghorns (Pens Nos. 7 and 8) were used. Fifty birds were placed in each pen, and all of them were fed wet mash in the morning, and grain was fed them in their litter at night. The birds in Pen No. 7 had, in addition, a dry mash hopper always available, and they were given supplies of shell grit and charcoal; they were also allowed some green stuff at midday and after the grain feed at night. The table below shows the average consumption of food per bird, the average number of eggs laid, and the average weights of the bird at the beginning and end of the test.

Although the birds in Pen No. 7 consumed over 9 lb. more wet mash in addition to 10 lb. dry mash, they lost an average of nearly 13½ oz. in weight per bird, but laid on an average eleven eggs more per bird.

Another experiment carried out was one to try if satisfactory results could be obtained from feeding lucerne chaff in dry mash. Two pens (Nos. 9 and 10) of Leghorns were used; there were 50 birds in each pen.

The wet mash of the birds in No. 9 pen consisted of 10 per cent. lucerne chaff, while a similar percentage was included in the dry mash given the birds in No. 10 pen. No. 10 pen consumed slightly less food and laid eighteen eggs more per bird than No. 9 pen, but the birds in No. 10 pen lost on an average 3½ oz. more in weight than did those in No. 9 pen. The table below shows the average consumption of food per bird, the average number of eggs, and the average weights of the birds.

Summary 1928–29.

Egg Yield, Feed Cost, and Average Weight of Birds (11 Months).

Pen.	Average Number of Eggs per Bird.	Value of Eggs.	Food Consumed per Bird.	Cost of Food.	Profit over Cost of Food.	Weight of Birds	
						Start of Test.	Finish of Test.
		£ s. d.	lb.	s. d.	s. d.	lb. oz.	lb. oz.
1. Dry Mash, Mineral 3 per cent., Grain ..	195·0	1 3 0	91·6	7 7½	15 4½	3 15	3 14
2. Dry Mash and Grain, 5 per cent. Mineral	181·3	1 1 8½	83·2	6 11	14 9½	3 14	4 0
3. Dry Mash and Grain, Pot. Iodide ..	185·4	1 2 7½	77·3	6 5½	16 2½	3 14	3 10½
4. Dry Mash only ..	163·3	0 19 9	84·4	7 0	12 0	3 10½	3 9
5. Grain only	146·4	0 18 7½	59·8	4 11½	13 8½	3 7½	3 10½
6. Dry Mash and Grain ..	195·3	1 4 1½	77·5	6 5½	17 8½	3 15	3 8½
7. Wet and Dry Mash, Grain	185·9	1 3 2½	109·3	9 1	14 1½	4 3	3 5½
8. Wet Mash and Grain ..	174·9	1 1 7½	89·6	7 5½	14 2	3 12½	3 7½
9. Wet Mash and Grain, Lucerne Chaff ..	172·4	1 1 3	89·6	7 5½	13 9½	3 11¾	3 7½
10. Dry Mash and Grain, Lucerne Chaff ..	190·9	1 1 10	86·9	7 3	14 7	3 14	3 6¼

Test No. 9a.—Second Year Test 1929-30 (11 Months).

Pen.	Average Number of Eggs per Bird.	Value of Eggs.	Food Consumed per Bird.	Cost of Food.	Profit over Cost of Food.	Weight of Birds.	
						Start of Test.	Finish of Test.
		£ s. d.	lb.	s. d.	s. d.	lb. oz.	lb. oz.
2. Dry Mash and Grain, Mineral 5 per cent.	136·3	0 14 1¼	87·7	7 7¾	6 5½	4 0	4 2·4
3. Dry Mash and Grain, Pot. Iodide ..	148·2	0 15 2	87·1	7 7¼	7 6¾	3 10·5	4 9·7
6. Dry Mash and Grain ..	157·0	0 15 7	87·9	7 8	7 11	3 8·5	4 1·7

Conclusions.

Over a two years' test the addition of a mineral mixture, or of potassium iodide, to the ration showed no evidence of improvement, either in production or in the appearance of the birds. Further, there was no noticeable difference in the quality of the eggs or the egg shells.

In some districts in Victoria the use of the mineral mixture has brought about a definite improvement in both the texture of the eggs and the general health of the birds, yet no conclusive evidence of this result has been obtained at Werribee.

Test No. 10.—Various Feeding Methods (White Leghorns).

This test was conducted with seven pens of pullets, 50 birds in each pen. It commenced 1st April, 1929, and concluded 28th February, 1930 (eleven months). Five of the pens were carried through for the second year commencing 1st April, 1930, and concluding 28th February, 1931 (eleven months). The different systems of feeding were as follow:—

Pen 1. Dry Mash containing 10 per cent. Dandy Meat Meal. Free Choice Grain.
Pen 2. Dry Mash containing 10 per cent. Cockbill Meat Meal. Free Choice Grain.
Pen 3. Dry Mash containing 10 per cent. M.I.B. Meat Meal. Free Choice Grain.
Pen 4. Dry Mash containing 10 per cent. Dried Buttermilk. Free Choice Grain.
Pen 5. Dry Mash containing no animal food. Free Choice Grain.
Pen 6. Dry Mash containing { 6 per cent. Dried Buttermilk. Free Choice Grain. / 4 per cent. Dandy Meat Meal. Free Choice Grain. / 4 per cent. Superphosphate. Free Choice Grain.
Pen 7. Dry Mash. Free Choice Meat Meals.

Summary of Results.

Pen.	Bran.	Pollard.	Meat Meals, &c.			Wheat.	Oats.	Barley.	Maize.	Average Food Consumed per Bird.	Average Cost of Food.	Average Number of Eggs Laid.	Value of Eggs.	Profit over Food Cost.	Profit for 2 Years or 22 Months.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	*s. d.*		*s. d.*	*s. d.*	*s. d.*
1 1st year ..	297½	501	88½ Dandy	..	..	1,560	447	..	589	69·6	6 1½	154·2	16 9	10 7½	17 5½
1 2nd year ..	200	403	66	..	..	1,355	700	331	359	68·3	4 3½	118·1	11 1½	6 10	
2 1st year ..	300	510	Cockbill 90	..	..	1,621	490	..	578	71·8	6 3½	158·1	17 0	10 8½	18 4
2 2nd year ..	207	423	70	..	..	1,262	787	318	329	67·9	4 1¾	124·7	11 9¼	7 7½	
3 1st year ..	260	441	M.I.B. 78	..	..	1,712	485	..	518	69·9	6 2	168·5	18 6½	12 4½	19 11½
3 2nd year ..	163	334	55	..	..	1,437	787	366	364	70·1	4 4	124·7	11 11	7 7	
4 1st year ..	295	505	Butter-milk 89	..	..	1,617	472	..	545	70·5	6 5	176·9	19 5½	13 0½	..
5 1st year ..	246	419	..	..	..	1,630	451	..	569	66·3	5 8¾	145·8	16 0½	10 3½	..
6 1st year ..	338½	566	Butter-milk 62½	Dandy 42½	Super. 42½	1,760	478	..	512	76	6 9½	166·8	18 3½	11 6	18 2
6 2nd year ..	226	455	48	28	28	1,321	591	398	359	69·1	4 6½	119·1	11 2¼	6 8	
7 1st year ..	166	293	Cockbill 22	M.I.B. 12	Dandy 164	1,920	506	..	469	71	6 5	168·9	18 7½	12 2½	20 5½
7 2nd year ..	126	254	10	10	197	1,453	709	246	273	65·5	4 6	132·0	12 9	8 3	

Test No. 11.—Various Feeding Methods (White Leghorns).

This test was conducted with five pens of pullets, 50 birds in each pen. It commenced on 1st April, 1930, and concluded 28th February, 1931 (eleven months).

The different systems of feeding were as follow:—

Pen 1. Free Choice of Bran, Pollard, Dandy, M.I.B., Cockbill, Wheat, Oats, Barley, Maize.

Pen 2. Free Choice of Dandy, M.I.B., Cockbill, Wheat, Oats, Barley, Maize.

Pen 3. Free Choice of Bran, Crushed Wheat, Crushed Oats, Crushed Barley, Wheat, Oats, Barley, Maize.

Pen 4. Free Choice of Bran, Crushed Wheat, Crushed Oats, Crushed Barley, Dandy, Wheat, Oats, Barley, and Maize.

Pen 5, Mash containing Brewers' Grain, Pollard, Crushed Wheat, Crushed Oats, Crushed Barley and Free Choice of Dandy, Wheat, Oats, Barley and Maize.

SUMMARY OF RESULTS.

Pen.	Bran.	Pollard.	Crushed Wheat.	Crushed Oats.	Crushed Barley.	Dandy.	Cockbill.	M.I.B.	Wheat.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1 ..	234	396	..	..	..	90	10	10	1,851
2 ..	..	..	..	..	..	165	20	20	1,813
3 ..	253	..	419	34	651	..	..	..	1,296
4 ..	198	..	437	37	603	100	..	..	1,444
5 ..	Brewers' Grain 156	157	54	54	54	145	..	..	1,573

SUMMARY—*continued.*

Pen.	Oats.	Barley.	Maize.	Average Food Consumed per Bird.	Average Cost of Food.	Average Number of Eggs Laid.	Value of Eggs.	Profit over Food Cost.
	lb.	lb.	lb.	lb.	*s. d.*		*s. d.*	*s. d.*
1 ..	549	301	218	73·2	4 6½	155·7	16 5½	11 11½
2 ..	659	279	238	63·9	4 3½	147	16 4½	12 1
3 ..	732	201	188	75·5	4 6	146·9	15 5½	10 11½
4 ..	595	203	178	75·9	4 8	160·3	16 6½	11 10½
5	669	252	287	68	4 5	162·6	17 1	12 8

Test No. 12—Werribee Feeding Tests.

These tests, which were conducted with 500 pullets divided equally into ten pens, commenced on 1st April, 1931, and concluded 29th February, 1932 (eleven months).

The following table gives particulars of the different systems of feeding, also a summary of results :—

Pen.	Breed.	Feeding.	Average per Bird.				
			Total Food Consumed.	Cost of Food.	Eggs Laid.	Value of Eggs.	Profit over Food Cost.
			lb.	*s. d.*		*s. d.*	*s. d.*
1	Australorps	Free choice of bran, pollard, meat-meal, wheat, maize, oats, barley	84	3 11½	165·6	14 11	10 11½
2	White Leghorns	Free choice of bran, pollard, meat-meal, wheat, maize, oats, barley	75	3 7½	160·1	14 6½	10 11
3	,,	Free choice of bran, pollard, ground barley, meat-meal, wheat, maize, oats, barley	75	3 7½	157·7	14 2½	10 6½
4	,,	Dry mash (six parts ground wheat, two parts meat-meal, one part dried buttermilk, one part bran). Free choice of wheat, maize, oats, barley	78	4 1½	180	16 3½	12 1½
5	,,	Dry mash (two parts each of ground wheat, ground oats, ground barley, meat-meal; one part each of bran and dried buttermilk). Free choice of wheat, oats, maize, barley	76	4 0½	184·8	16 6½	12 6½
6	,,	Dry mash (three parts each dried distiller's grains, pollard; one part each ground wheat, ground oats, ground barley. Free choice of wheat, maize, oats, barley	75	3 6½	164·6	15 1½	11 6½
7	,,	Free choice of ground wheat, ground oats, ground barley, ground maize, meat-meal. No whole grain	69	4 0½	122·1	11 5½	7 5½
8	,,	Free choice of bran, ground wheat, ground barley, ground maize, meat-meal, wheat, maize, oats, barley	70	3 6	135·7	12 9½	9 3½
9	,,	Free choice of bran, ground wheat, ground oats, ground barley, meat-meal, wheat, maize, oats, barley	73	3 6	149·6	13 11½	10 5½
10	Australorps	Free choice of bran, ground wheat, ground oats, ground barley, meat-meal, wheat, maize, oats, barley	67	3 2	149·2	13 8½	10 6½
		Average for 500 birds	74	3 8½	157	14 4½	10 8

NOTES.—Average price of eggs 1s. 1d. per dozen. Food cost per dozen eggs laid 3·4 pence. Food consumed per egg laid 7·5 oz. Food consumed per bird per day 3·54 oz. Food cost per bird per week ·95 pence.

CONCLUSIONS.

These tests were conducted chiefly to determine the advisability or otherwise of using ground grains instead of or in conjunction with bran and pollard.

The dry mash mixtures (Pens 4, 5, and 6) contained a large proportion of ground grains and gave very satisfactory results.

In Pens 4 and 5 30 per cent. of animal food was used in the mash ; this, of course, increased the cost of food, but the profit over food cost was still greater than in the other pens. It must be remembered that in these pens the birds consumed over three times as much whole grain as mash, therefore the percentage of animal food to the total food consumed was approximately 6 per cent.

In spite of the fact that in Pen 6 no animal food was used, the birds laid reasonably well. In this pen 30 per cent. of dried distillers' grains was used in the mash in conjunction with pollard and ground grains. This food, which contains 20 per cent. protein and can be purchased at approximately the same price as bran, is evidently quite suitable for egg production.

Test No. 13.—Research Farm, Werribee Feed Tests, 1st April, 1932, to 31st March, 1933 (12 months).

Pen (50 Birds per Pen).	Bran.	Pollard.	Maize Oil Meal.	Meat Meal.	Total Meals.	Wheat.	Oats.	Maize.	Barley.	Total Grain.	Total Food.	Cost of Food.	Total Eggs.	Value of Eggs.	Profit over Food Cost.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	£ s. d.		£ s. d.	£ s. d.
1. Australorps (Semi-intensive Dry Mash, Mixed Grain)	907	907	..	201	2,015	1,187	395	395	395	2,372	4,387	12 17 4	9,679	41 11 1	28 13 9
											Av. 87·7	0 5 1¼	193·6	0 16 7½	0 11 5½
2. Australorps (Intensive Dry Mash, Mixed Grain)	881	881	..	195	1,957	1,187	395	395	395	2,372	4,329	12 14 2	8,541	36 13 11	23 19 9
											Av. 86·6	0 5 1	170·8	0 14 8	0 9 7
3. White Leghorns (Semi intensive Dry Mash, Mixed Grain)	960	960	..	214	2,134	1,187	395	395	395	2,372	4,506	13 4 3	10,218	42 13 10	30 9 7
											Av. 90·1	0 5 3½	204·4	0 17 5½	0 12 2½
4. White Leghorns (Intensive Dry Mash, Mixed Grain)	810	810	..	181	1,801	1,187	395	395	395	2,372	4,173	12 5 6	9,093	39 3 3	26 17 9
											Av. 83·5	0 4 11	181·9	0 15 8	0 10 9
5. White Leghorns (Intensive Free Choice Meals and Grain)	180	180	182	250	792	2,160	467	492	364	3,483	4,275	13 7 2	8,909	38 4 8	24 17 6
											Av. 85·5	0 5 4	178·2	0 15 3½	0 9 11½
6. White Leghorns (Intensive Dry Mash, Mixed Grain)	616	616	616	204	2,052	1,187	395	395	395	2,372	4,424	13 5 6	9,577	40 16 2	27 10 8
											Av. 88·5	0 5 3½	191·5	0 16 4	0 11 0½
7. White Leghorns (Intensive Free Choice Grains and Meat Meal)	..	..	..	320	320	2,773	545	..	452	3,770	4,090	12 5 5	8,699	37 6 0	25 0 7
											Av. 81·8	0 4 11	174·0	0 14 11	0 10 0
8. White Leghorns (Intensive Free Choice Grains and Meat Meal)	..	..	..	320	320	2,560	504	530	450	4,044	4,364	13 18 2	8,868	38 7 7	24 9 5
											Av. 87·3	0 5 6½	177·4	0 15 4½	0 9 9½
9. White Leghorns (Intensive Dry Mash, Free Choice Grain)	454	454	..	101	1,009	2,040	443	570	340	3,393	4,402	13 5 5	9,141	39 7 2	26 1 9
											Av. 88·0	0 5 3½	182·8	0 15 9	0 10 5½
10. Australorps (Intensive Free Choice Meals and Grain)	288	180	122	40	630	2,440	462	530	350	3,782	4,412	13 4 8	8,498	36 13 6	23 8 4
											Av. 88·2	0 5 3½	170·0	0 14 8	0 9 4½
Total 500 Birds ..	5,096	4,988	920	2,026	13,030	17,908	4,396	4,097	3,931	30,332	43,362	130 7 7	91,223	391 17 2	261 9 1
Averages ..	..	..	..	..	26·06	..	..	..	..	60·66	86·72	0 5 2½	182·45	0 15 8	0 10 5½

NOTES.—Average price of eggs, 1s. 0½d. per doz. Food cost per dozen eggs laid, 4·1 pence. Food consumed per egg laid, 7·6 oz. Food consumed per bird per day 3·8 oz. Food cost per bird per week, 1·2 pence.

VII.—BURNLEY EGG-LAYING COMPETITION AND THE VICTORIAN POULTRY INDUSTRY.

Egg production is the most profitable branch of poultry farming, and to-day hundreds of thousands of pounds are invested in the business, not only in the metropolitan area, but throughout the State. Thousands of birds are bred to produce eggs for the Melbourne market, and during the flush the surplus is exported to Great Britain.

The Department realized that, if the poultry industry was to be made a prosperous one, it would be necessary to develop an overseas trade, and to do this, we must export eggs equal in quality and weight to those supplied by countries with which we have to compete.

Egg-laying competitions have become an efficient group of agencies in the awakening of poultry-breeders to the paramount importance of the individual hen and her pedigree; hence the necessity of trap-nesting, single testing, and single mating.

In 1911 the Department inaugurated the Burnley egg-laying competition, which has been conducted annually ever since.

The Burnley competition is recognized as the high-water mark in egg-laying competitions. The conditions are exacting, the supervision is strict, the results are official, and are accepted throughout the world.

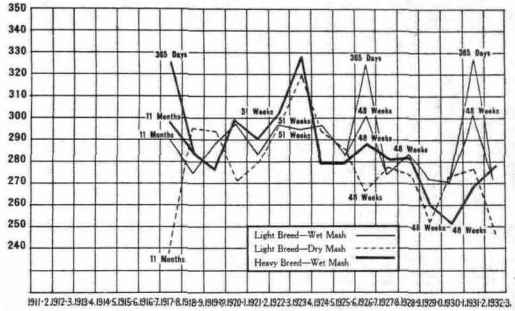
The Burnley competition, as conducted under Government supervision, stands to-day in the same relationship to the poultry industry as the Government herd test does to the dairy industry, inasmuch as it sets the standard.

Just as the progressive dairy farmer is seeking to improve his herd by introducing stock bred from tested cows, so is the progressive poultry-breeder improving his flocks by using birds bred from tested hens. There is ample evidence to prove that much of the improvement that has taken place in the flocks of Victoria is due to the distribution of stock bred from birds with authentic records that have been made at this competition. There is not the slightest doubt that this competition is responsible for a wonderful improvement in the size of eggs laid by birds throughout Victoria. In the 1923-24 competition, it was noted that of 60 teams competing, 31 failed to lay eggs that would weigh 24 oz. to the dozen. (Eggs were then weighed in dozens.) After some opposition the rules were altered, and it was decided to count only first-grade eggs (i.e., 2 ounces or over), and to weigh every egg laid by each hen. In 1926-27 competition, 117,000 eggs were laid, and 85.94 per cent. weighed 2 ounces and over. In 1932-33, 121,945 eggs were laid, and 93.6 per cent. were first grade, a result probably not surpassed at any *competition in the world.*

The weighing and recording of every egg laid every day entails a great amount of work, and adds considerably to the cost of conducting the competition; but the value of the information to the breeders, and the tremendous improvement that is taking place in the stamina of the *flocks and the size of the eggs laid by them, will repay the State many* times over.

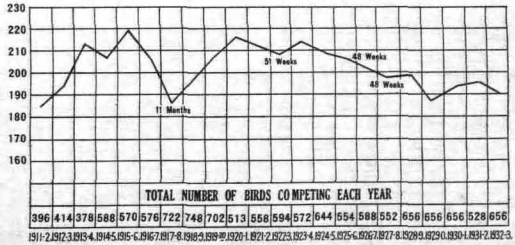
BURNLEY EGG-LAYING COMPETITION 1911 to 1933

YEARLY VARIATIONS OF THE NUMBER OF EGGS LAID BY THE LEADING INDIVIDUAL BIRDS



Note.—Since 1928-29, except where shown, records are for 48 weeks.

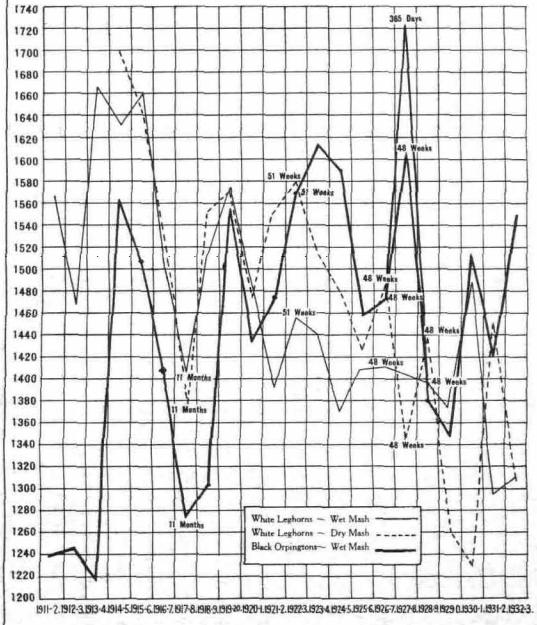
Yearly Variations of the Average Number of Eggs Laid by All the Birds in the Competition.



Note.—Since 1928-29, except where shown, records are for 48 weeks.

BURNLEY EGG-LAYING COMPETITION 1911 to 1933

Yearly Variations of the Number of Eggs Laid by the Leading Teams (6 Birds to Each).

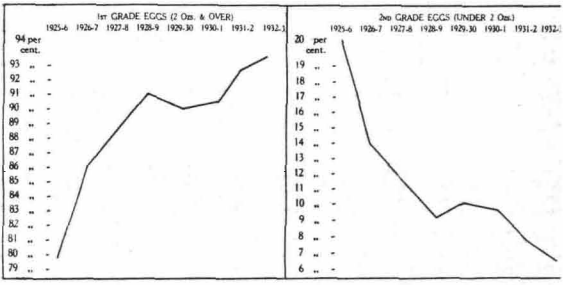


Note.—Since 1928-29, except where shown, records are for 48 weeks.

As birds are entered for competition by breeders from almost every part of Victoria—some experienced and others inexperienced—the above results can be taken as a good indication that the improvement is general throughout the State, and that breeders now realize that only birds of good type and robust constitution can lay eggs of the required weight.

That this competition is proving a good advertisement for Victoria is shown by the fact that the results at Burnley are keenly watched by breeders in the principal poultry-producing countries overseas, and the demand for stud stock from these countries is increasing.

During the past few years Burnley competitors have exported stud stock to England, Denmark, Holland, South Africa, Canada, several States in America, Japan, and Honolulu, and many repeat orders have been received.



Graph showing Improvement in Size of Eggs Laid in the Burnley Egg-laying Competition between the years 1925-26 to 1932-33.

	52 Weeks.	48 Weeks.				
	1925–6.	1926–7.	1927–8.	1928–9.	1929–30.	1930–31.
1st Grade Eggs ..	89,547	100,618	95,105	115,257	108,569	111,919
2nd Grade Eggs ..	22,693	16,357	12,533	11,731	12,248	12,017
Total ..	112,240	116,975	107,638	126,988	120,817	123,936
Average Eggs per Bird	206·3	202·3	197·8	199	187·3	193·3
Percentage of 1st Grade	79·7	86	88·5	90·8	90	90·3
Percentage of 2nd Grade	20·3	14	11·5	9·2	10	9·7

VIII.—HOUSING.

Site.

The best site for the poultry yards is a slope with a north-eastern aspect, having a clear opening through which the morning sun may reach the yards. Good drainage is essential, as poultry will not thrive on heavy wet soil; sand or sandy loam is undoubtedly the best, though, of course, there are successful poultrymen throughout the State who are keeping fowls on various other kinds of soils

Buildings.

However small the start in poultry-keeping, a ground plan should be prepared before any buildings or fences are erected. This plan should provide room for the extension of every class of building it is intended to erect and the possibilities in this direction should be well thought out. In the arrangement of the buildings, due consideration should be given to the convenience of feeding and watering. Where a large number are to be kept this is essential.

In most parts of Victoria buildings for adult stock should face the east, whether it is intended to keep them on the intensive, semi-intensive, or open system.

By the intensive system is meant keeping the birds all the time in sheds and supplying them with everything they need—food, water, green stuff, shell grit, charcoal and material for the dust bath.

On the semi-intensive system they are kept in sheds, but allowed an outside run in fine weather.

On the open system the birds are always at liberty, and use a house only for roosting in at night.

In Victoria the open-fronted house is best; and as the north, west, and south sides are closed in, the birds are protected from the strong wind and heavy rain that sometimes come from those directions. Very little wind or rain comes from the east.

By having the east side open, or nearly so, the early morning sunlight will shine right into the house; this will keep the air sweet and pure and help to keep in check vermin, which become numerous and almost impossible to exterminate in dark, ill-ventilated buildings.

The three sides of the house should be wind-proof, as draughts have a bad effect on birds. It is very important that the roof should be rain-proof; damp floors cause foul odors to rise, and are often the cause of unhealthiness amongst birds.

Great attention should be paid to the floor, which should be from 4 to 6 inches higher than the ground surrounding the house. This will ensure a dry floor at all times, as the water off the roof will not soak in on the floor.

Concrete laid to a depth of $1\frac{1}{2}$ or 2 inches forms the best floor, and should be covered with either cocky chaff or straw as scratching material. Where it is not possible to put in concrete,

a good floor can be made from some soils, well wetted and rammed smooth. Both in the Goulburn Valley and at Werribee good floors can be made by puddling the soil with a spade to a depth of from 4 to 5 inches, working in sufficient water with the soil to make it about the consistency of porridge. It should then be allowed to set for three or four days, and then gone over with a rammer. A piece of redgum 6 in. x 6 in. x 12 in. with a piece of ¾-in. water pipe in the centre for a handle makes a good tool for the job. Should the floor show any cracks, a little sand or powdered earth swept in and again rammed will make a good finish. Where the soil is suitable a splendid floor can be made in this way, and it will set so hard that the birds cannot scratch holes in it, and it is easily kept clean.

Material Required for Buildings.

In choosing material for the house one must be guided largely by what is available in his district.

Excellent houses may be built of flattened-out kerosene tins, but it is necessary to paint these or their life will be short.

Palings put on the lap and space principle are often used, though there is a great risk of vermin breeding in the cracks. They can, however, be kept down by frequent sprayings with sheep-dip, kerosene or carbolic emulsions, which can be very easily and cheaply made. An effective emulsion can be made from the following materials:—

1 lb. common soap
2 gals. kerosene
1 gal. boiling water.

This emulsion may be used in the proportion of one part to ten parts of water.

A very good temporary house can be made by building a frame and covering it with tarred bags, but corrugated iron should always be used for the roof.

In some of the Northern districts mud bricks are used. Where the soil is suitable they can be very cheaply made and will last a lifetime, but galvanized iron is the best of all—plain iron for the ends and back (26 gauge will do), corrugated for the roof, and if the framework is on the outside very little harbor is left for vermin. The iron should have two coats of Arabic or some other heat-resisting paint. This is not expensive, and if put on well it will last three or four years, and will probably save the lives of some of the best layers, as it is the heavy layer that goes down first with heat apoplexy.

Ventilation.

It is most important to provide ventilation at the back of the house, and we find the best way to do it is to allow a 6-inch space between the roof and the top of the back wall; a weatherboard can be hinged to the roof plate, and in hot weather it may be opened up, thereby allowing a current of air right through the building under the roof. This will lower the temperature of the house considerably.

Height.

The poultry house should be of a height to allow head room when working in it. Six feet in front sloping to 5 feet at the back is sufficient for narrow houses used for breeding pens, single-testing pens, or those for small lots of twelve to twenty birds, but where it is desired to keep larger flocks on the intensive system, it is advisable to have the houses from one to two feet higher.

Perches.

The perches should be not less than two inches wide, and when required for a long house 3-inch x 2-inch hardwood with the corners planed off is most suitable. For smaller houses 2-inch x 1-inch timber will do. It is best to suspend them from the roof by wire—if this is done the house is much easier to clean, as there is no obstruction for broom or scraper; it is also much better for the birds. The perches should have a coat or two of hot tar before being placed in position—this will fill up any cracks in the timber, for it is in these cracks and crevices that mites make their home and breed, and emerge at night to prey upon the fowls, only leaving them when they are gorged with blood; it is owing to the colour they assume when filled with blood that they are commonly called Red Mites. These are one of the worst pests in a poultry house, and it requires constant attention to keep them in check.

Perches should not be less than 2 feet from the ground, so that the birds can pass freely underneath. This height leaves plenty of room for the broom. If dropping boards are used, the perches can be hung 3 feet from the ground, and the boards should be 14 inches below the perches.

The perches should be all on one level—not one above the other, as used to be the custom. If the perches are of varying heights the birds will fight for the topmost position, with the result that some may be injured.

The higher the perch the greater the danger of birds bruising the ball of the foot, resulting in what is commonly known as bumble-foot. This is not only painful to the birds, but often renders the male bird useless for breeding purposes.

About 8 inches should be provided for each bird on the perch, and if there be more than one row of perches they should be 15 inches apart.

Nest Boxes.

When possible, nest boxes should be placed 2 feet or 2 ft. 6 in. from the ground, as it saves time and makes it much easier for the attendant when gathering the eggs. Kerosene or petrol tins make the best nests, and are easily kept free from vermin. One nest tin to every four birds is sufficient.

Litter.

It is advisable to keep from 4 to 6 inches of scratching material on the floor of the house, either cocky chaff or straw. The front of the house should be boarded up 15 or 18 inches to keep the scratching

material inside the house and prevent waste. If this is done a supply will last three or four months. In wet weather the grain can be fed to the birds in this litter instead of on the ground.

If manure pits are used they prolong the life of the litter, as most of the manure is voided at night and this will fall into the pits instead of into the straw. It is a simple matter to rake off the manure and scatter a few handfuls of sand on the boards. This prevents the manure adhering to them.

SIZE OF HOUSES.

A house 6 feet x 8 feet will accommodate from twenty to twenty-five birds if they have an outside run, but if it is desired to keep them confined on the intensive system, 4 square feet of floor space should be allowed to each bird.

It is generally believed by poultrymen that hens run in small flocks give the best results, but these small flocks entail a vast amount of labour in attendance and a much larger expenditure in construction and maintenance than is the case with flocks of from one to five hundred.

By building a better class of house with provision for scratching material, almost equal results can be obtained, and there is no question of its superiority.

Method of Housing for Intensive Poultry Farming.

The intensive system of keeping poultry for egg production has been in operation in Victoria for many years.

An indication of its success is the number of poultry-farmers who, commencing in a small way some years ago, now breed thousands of birds for egg production and keep them under intensive conditions. The majority of these have erected sheds varying in depth from 10 feet to 16 feet, with a height in front of 6 feet to 9 feet, and falling to 5 or 7 feet at the back. The sheds are divided with wire-netting partitions into compartments to hold such number of birds in each as is considered suitable.

Most farmers allow 4 square feet of floor space to each bird; thus the length of the building is governed by the number of birds to be housed. When large numbers are to be kept, it may be necessary to build several houses. If so, they must be spaced sufficiently far apart to allow the sun to shine into each row of pens during the morning. This helps to keep the scratching material dry and to purify the air. It will also keep vermin in check; it is in dark, badly-ventilated pens that these pests breed most freely.

A great improvement in the style of intensive poultry-houses is to be seen on several commercial farms where intensive poultry-keeping is carried on.

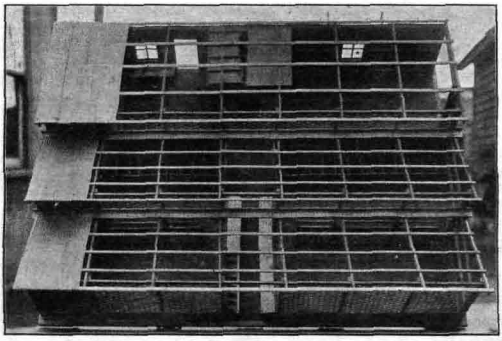
The shed most favoured to-day has what is known as a saw-tooth roof of somewhat similar construction to that used in many factory buildings. Each section of the saw-tooth is 9 feet deep, with a height to the roof in front of 10 feet, falling to 7 feet at the back.

This style of roof ensures perfect ventilation. In Victoria the house should face east or north-east; then on each sunny day sunlight will strike the floor through the 3-feet space at each section of the saw-tooth.

If the roof overhangs 2 ft. 6 in. or 3 feet in front of each section very little rain, if any, can beat in. Nearly all the sheds of this type are divided into small pens of 9 feet by 6 feet, in which poultrymen keep twelve to fourteen birds.

The reason given by some for keeping birds in small numbers is that higher egg production is obtained than when larger pens are provided and a greater number of birds are kept together.

Certainly individual birds may lay more eggs if placed in a single pen than they would if running in a flock; but for egg production on a commercial farm, it is yet to be proved that birds of equal quality

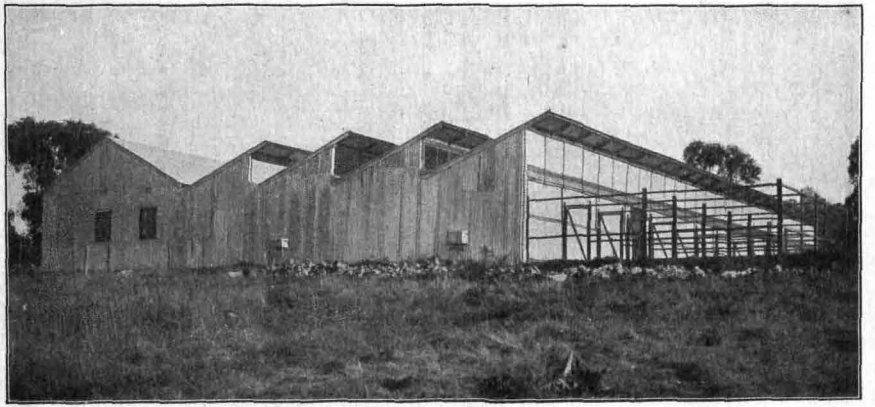


Model of Buildings for Poultry-farmer.—Poultry-house, Feed-room, Egg-room, Garage, &c.

will lay more eggs when kept in lots of twelve than when housed in lots of 50 to 100, provided, of course, that ample hopper space or a feeding trough is made available to the birds.

Owing to the present economic position, it is absolutely necessary to reduce the cost of producing eggs so as to enable us to meet the low prices now ruling (1933).

To erect sheds of the type spoken of above, and divide them into small pens capable of holding twelve to fourteen birds each, means that for every 1,000 layers kept from 70 to 80 pens will be required; this means that from 70 to 80 gates must be opened each time the birds are fed. By increasing the size of the pens to 18 feet by 18 feet only twelve pens would be required for each 1,000 layers. Apart from the consequent saving in material, it must be remembered that with the

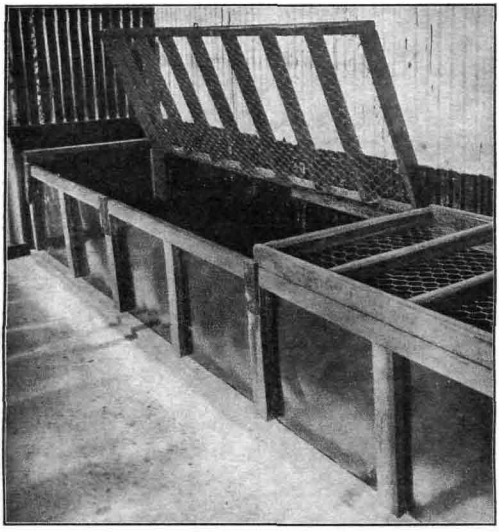


Poultry Shed at Mr. F. J. McKay's, Eltham.

(For the first year the front was closed in with glass cloth, as the first section was being used as a brooder house.)

larger pens there would be a saving in time and labour which, where there is a large plant, would help considerably in cutting down the cost of production.

On page 96 is reproduced a photograph of a model of a set of buildings suitable for a poultry-farmer. This model was made by the late Mr. F. Zeven, foreman carpenter of the Department of Agriculture. Its scale is 1 inch to 1 foot. Provision is made for a feed-room, troughs, bins, &c., grain silo, egg-room, and garage or bulk store; there is also accommodation for 160 layers in two pens 18 feet by 18 feet, with



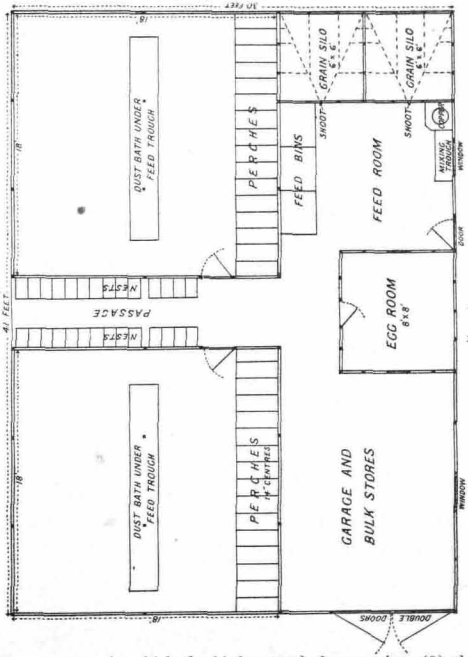
Manure Pit.—One Section Open for Cleaning.

manure pits and nest boxes. More pens can be added as desired at very low cost, as in each section there would be required only the two end walls and the roof, the balance being wire-netting. This model has been exhibited on the Better Farming Train, and has been favorably commented on by many experienced poultrymen. Several sheds have been built somewhat after this model, and they are giving satisfactory results.

When the Better Farming Train is not on tour the model is stored at 605 Flinders-street, Melbourne, where all who are interested are invited to inspect it. A plan of the building in the model is shown

below. In this plan the building of several sheds, one behind the other, is provided for. A list of the material required to build a house of two pens each 18 feet by 18 feet is set out on page 103.

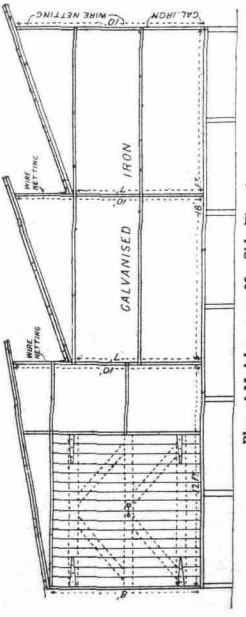
Some poultrymen raise objections to the use of manure-pits below the birds' roosting place. Their principal objections are—(1) that they take up too much floor space, restricting the amount available for the



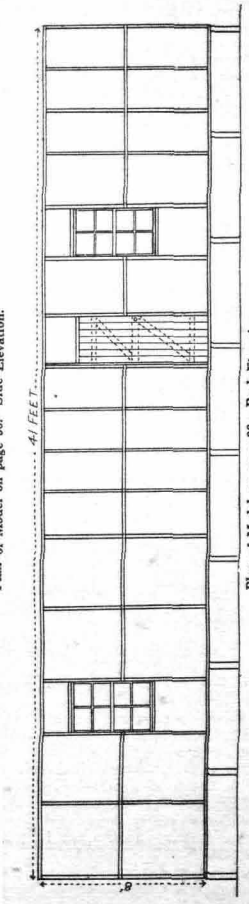
Ground Plan of Model illustrated on page 96.

litter or straw, in which the birds scratch for exercise; (2) that they are a harbour for red mites.

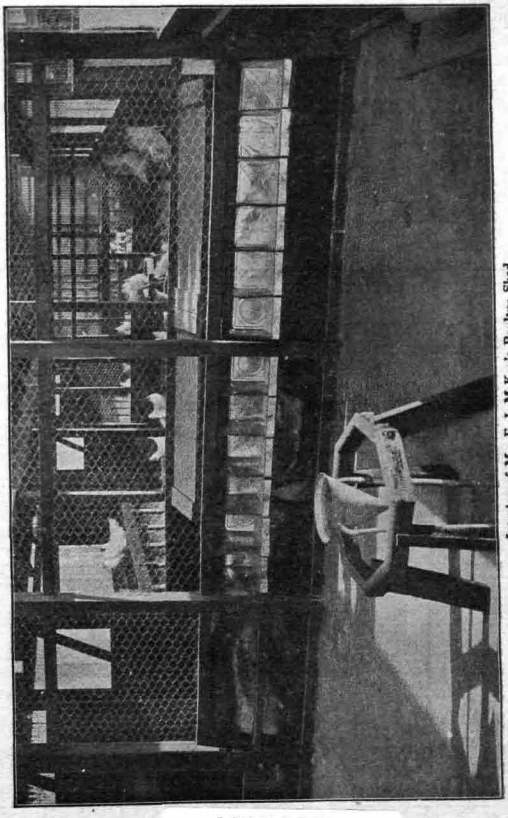
But probably the advantages far outweigh the disadvantages. In the first place, it is estimated that over 75 per cent. of a fowl's manure is voided while she is perching; if this amount can be received in the pit, the litter need not be changed so frequently, thus there will be a saving in the cost and labour of renewing it, and, further, the birds will have better sanitary conditions.



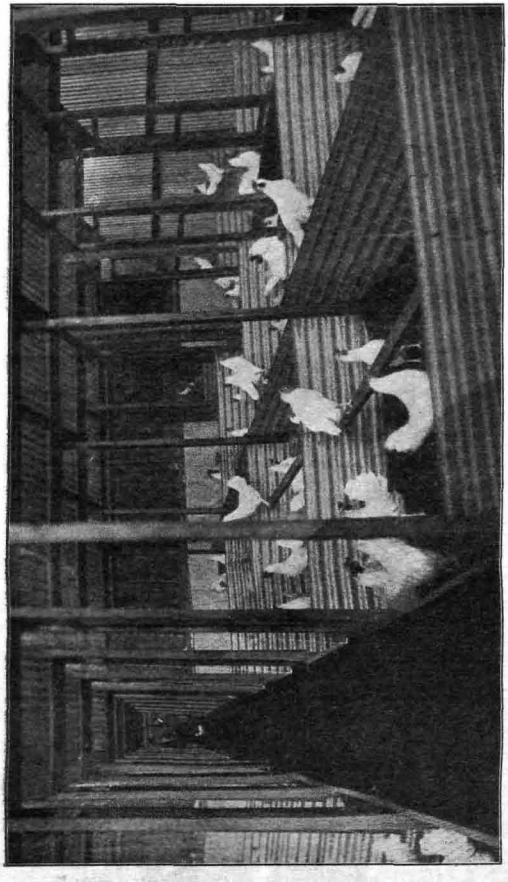
Plan of Model on page 96.—Side Elevation.



Plan of Model on page 96.—Back Elevation.



Interior of Mr. F. J. McKay's Poultry Shed.



Section of Poultry-shed at Mr. M. G. Leech's Trevallyn Poultry Farm, Campbellfield, showing it as originally constructed. The partitions between the small pens have since been removed.

There is no doubt that the birds get just as much exercise in pens provided with manure-pits as in those wherein there are none, as they are continually flying up and down from the perches.

To guard against red mites, the perches and frames should be given two coats of hot tar before erection. These will fill cracks and gum veins in the timber, which might otherwise provide places in which mites would lay their eggs. Then, with ordinary care in painting or spraying, no more trouble will be experienced than in any other system of perching.

It is important that the floor of the manure-pit be perfectly dry; if it be so, no obnoxious odour will rise even though the pit be not cleaned out for some weeks.

The manure taken from these pits, being free from dirt or straw, can be bagged, and commands a high price from market gardeners, orchardists, and others.

The illustration on page 97 shows a shed on the poultry farm of Mr. F. J. McKay, at Eltham. This shed was built according to the plan on page 99, except that there is a gable roof over the feed-room, &c., whereas the plan provides for a skillion roof.

A shed built by Mr. M. G. Leech, Trevallyn Poultry Farm, Campbellfield, is illustrated on page 102. This shed houses over 2,000 birds, and when first built was divided into small pens to hold twelve birds in each. A number of the partitions, however, has since been removed, and the pens now hold 50 birds each. Mr. Leech states that he is getting most satisfactory results with the enlarged pens.

The list of material required for the building of a shed 41 feet x 30 feet, with saw-tooth roof, capable of housing 160 birds, with an egg-room, feed-room, grain-bins, and garage, is as follows:—

Thirty 3-ft. 3 x 3, jarrah stumps.
Four 16-ft., four 14-ft., four 12-ft., twelve 10-ft., 3 x 2, hardwood wall plates.
Seventy 10-ft., twenty 8-ft., 3 x 2, hardwood studs.
Three 18-ft., six 12-ft., 4 x 2, hardwood rafter bearers.
Twelve 14-ft., sixteen 12 ft., 4 x 2, hardwood rafters.
Four 18-ft., three 16-ft., three 14-ft., fifty-eight 12-ft., 3 x 1½ hardwood roof and wall battens.
Eight 12-ft., 6 x 1, hardwood gutter boards.
Eight 12-ft., 4 x 1, hardwood gutter boards.
Two 10-ft., two 8-ft., 3 x 1½, hardwood pen door studs.
Four 18-ft., 3 x 1½, hardwood manure-pit framing.
Four 18-ft., four 14-ft., 3 x 1, hardwood framing for nest boxes.
Four 14-ft., six 12-ft., two 10-ft., 2 x 1, hardwood pen doors and movable ends to manure-pit framing.
Eight 10-ft., two 12-ft., 2 x 1, hardwood perches.
Twenty-six 3-ft., 2 x 2, oregon perches.
Five hundred feet, 6 x ⅝, white Baltic doors, feed bins, and trough.
Four 14-ft., one 12-ft., 9 x 1, oregon dust baths.
Twelve 10-ft., 4 x 2, hardwood silo floor framing.
One hundred and fifty 6-ft., 6 x ½, hardwood silo lining.
Sixteen sheets, 8 x 4, fibrolite egg-room walls and ceiling.
Four 4-ft. x 2-ft. 4in., x 1½, sashes and frames, complete; also gutters and silo.
Thirty-three sheets, 6 x 3 x 26-g., plain-iron covering for nests below lining.
Six sheets, 6 x 2 x 26-g., manure-pit fronts.
Forty-eight 7-ft., ninety-six 6-ft. sheets corrugated galvanized iron roof.
Twenty-six 8-ft., eighteen 7-ft., twenty-four 6-ft., twenty-four 5-ft. sheets corrugated galvanized iron walls.
Twelve yards, 36 x 3 x 16-g., wire-netting perches.
One hundred yards, 36 x 2 x 18-g., wire-netting walls.

A House for 480 Birds.

Poultry houses should be dry, well ventilated, free from draughts, with plenty of sunshine, and room enough for the birds to move about in comfort. All these factors are necessary if fowls are to be kept healthy, vigorous, and productive.

Houses for adult fowls should be open-fronted and, as already stated, should face the east. The south-west and north walls should be wind-proof, as nearly all our strong winds and wet weather come from those directions, very little wind or rain coming from the east. If open to the east, the early morning sun will shine right into the house, and help to keep the air pure and sweet.

If fowls are to be kept on the intensive system, 4 square feet of space should be allowed for each bird.

Location.

Poultry buildings should be built on high or sloping ground; a north-easterly aspect is to be preferred.

Floor.

The floor of the poultry house should be at least 6 inches higher than the surrounding ground, so as to ensure good drainage and dryness. This makes the house warmer, drier, and more cheerful, and adds to the productiveness of the flock.

Cement or brick floors are quite satisfactory, and are sanitary and easy to clean, but are a little expensive to build.

Floors should always be kept well covered with 4 to 6 inches of litter, otherwise they will be cold and uncomfortable for the birds.

The Interior.

The interior should be simple and convenient to clean. The roosts should always be in the back of the house, away from openings, so as to lessen the draughts and cold the birds will have to endure. About 8 inches perch room should be provided for each bird; perches should be 15 inches apart and all on one level, and not more than 2 ft. 6 in. from the floor. A manure-pit should be provided; this not only prolongs the life of the litter, but the manure being free from litter, will bring a higher price when sold.

On pages 106-7 are illustrations of a Laying Shed at the State Research Farm, Werribee. A house built on this plan, 120 feet long, 16 feet deep, 7 ft. 6 in. high in front, and 6 feet at the back, will accommodate 480 birds. As will be seen, it is divided into four pens (each 30 feet long). Ventilation is provided by a 6-inch ventilation board the full length of the house at the back, close to the roof, which allows a current of air to pass through; this is high enough above the birds to prevent draughts, and keeps the roof cool even on the hottest day.

The birds roost at the back, over a manure-pit—Fig. 1 (A)—which can be cleaned out by lifting up the roosting frame—Fig. 1 (B). Each pen is provided with a dust bath, to help the birds to keep themselves free from vermin.

Feed trough—Fig. 2 (A)—is built on to the front, and a water system, controlled by a ball tap, is laid on inside; this ensures a constant supply of cool, clean drinking water.

The nest boxes—Fig. 2(B)—are built along the front, and a hinged lid is provided to enable the attendant to gather the eggs from outside if desired. The house has small sliding doors—Fig. 2 (C)—so that the birds can be let out for a run when the weather is suitable.

A wire-netting shutter is placed in front of each pen—Fig. 2 (D)—through which the litter can be thrown when it is desired to clean out the house and put in fresh litter.

The approximate cost of such a shed is £120, equal to 5s. per bird. If properly constructed it would last for a number of years, and would mean a saving in both money and labour.

Specification of Poultry Shed 100 feet x 15 feet at above Farm.

52/1′ 6″, 3 x 3 jarrah blocks.
21/6′, 3 x 2 hardwood studs, back wall.
21/7′, 3 x 2 hardwood studs, front wall.
20/7′, 3 x 2 hardwood studs, ends and partitions.
20/20′, 5/16′. 3 x 2 hardwood plates top, bottom and partitions.
21/16′, 4 x 2 hardwood rafters.
25/20′, 3 x 1½ hardwood battens, roof.
15/20′, 15/16′, 3 x 1 hardwood battens, walls and partitions.
20/3′, 3 x 2 hardwood manure pit framing.
12/18′, 3 x 1 hardwood manure pit framing.
64/3′, 2 x 1½ hardwood dressed for perches.
20/12′, 2 x 1 hardwood dressed for perches.
8/12′, 10/8′, 2 x 1 hardwood partition doors and movable fronts to pens.
18/2′, 3 x 2 jarrah framing for nest tins.
15/20′, 2 x 1 hardwood framing for nest tins.
650′, 6 x ⅞ T. and G. white baltic doors, feed trough, and cover for nests.
½ roll, rubberoid covering for feed trough and nests.
150′, 2 x 1½ hardwood perches in front feed trough
57/9′ sheets corrugated galvanized iron roof.
57/8′ sheets corrugated galvanized iron roof.
50/6′ sheets corrugated galvanized iron, back wall.
14/7′ sheets corrugated galvanized iron, end walls.
9 sheets 6 x 3 plain iron partitions.
34 sheets 6 x 2 plain iron manure pit front.
300′ x ¾ hoop iron feed troughs.
50 yd. 48″ x 2″ x 18g, wire netting, front and partitions.
33 yd. 36 x 4 x 16, wire netting, under perches.
24 pairs 6″ T hinges, feed and nests.
10 pairs 10″ T hinges, partition doors.
2 pairs 16″ T hinges, end doors.
10 lb. *spring head* nails.
14 lb. 3 x 9 wire nails.
14 lb. 2 x 12 wire nails.
3 lb. ¾″ clouts.
48 kerosene tins for nests.

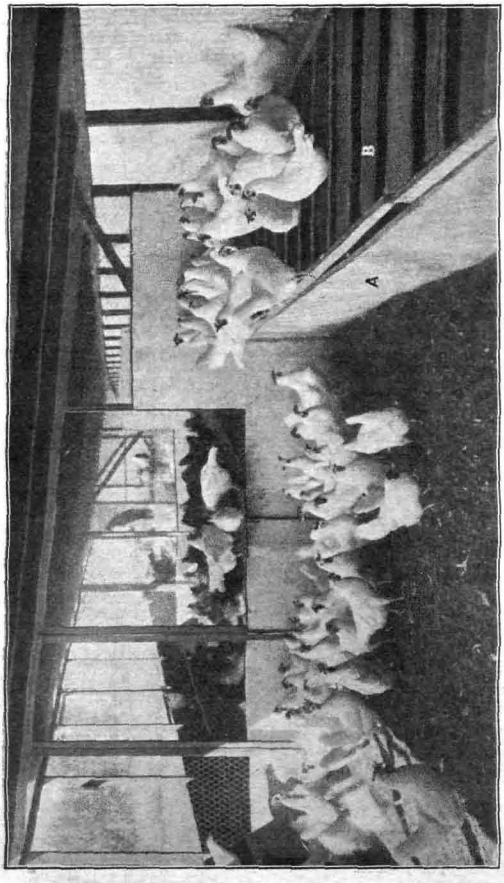


Fig. 1.—Interior of Poultry Shed at State Research Farm, Werribee.

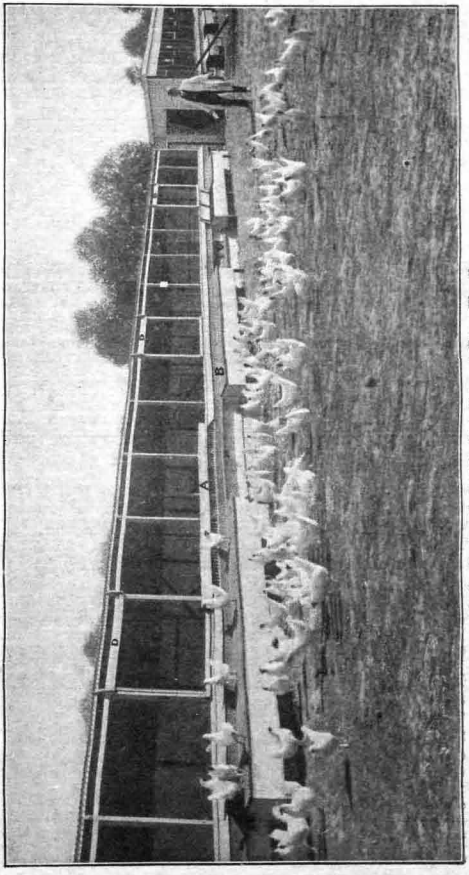


Fig. 2.—Poultry Shed at the State Research Farm, Werribee.

Breeding Pen.

The breeding pen should have an outside run, as birds kept too closely confined produce a great many infertile eggs.

The breeding pens at the Werribee Farm can be recommended as models. They are 60 feet long and 12 feet wide, with a house at one end. The houses are built to serve two yards, and are 16 feet

Breeding Pens.

wide by 6 feet deep, 6 feet high in front and 5 feet at the back, divided in the centre by wire-netting. Each yard has a house 8 feet by 6 feet; this allows 1 ft. 4 in. for the nest boxes (which are built to open from outside, so that the attendant may gather the eggs without entering the yard) and 2 ft. 6 in. for a gate to each yard.

All gates should be at least 2 ft. 6 in. wide, so that a wheelbarrow may pass through.

Half of the front of each house is closed in and boarded up 12 inches so as to confine the scratching material to the house and prevent waste. A dust bath is provided, and there is room for five nest tins in the laying portion. Water is provided in a half-round earthenware pipe running the full length of the yards on the outside; it is set level, 1 foot from the ground, and a tap at one end is provided; holes are cut in the netting at intervals through which the birds put their heads to drink. A board cover should be placed over the trough to protect the water from the sun.

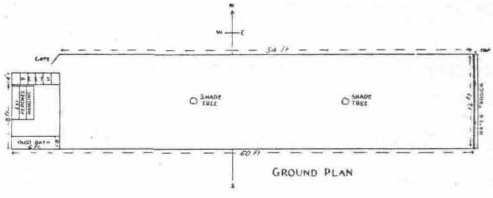
When building permanent yards of this description, it is very necessary to make provision for keeping the soil in good sanitary condition. This can be done by occasional dressings of lime, and by breaking up the surface of the ground to a depth of 2 or 3 inches. To do this with the least labour, a horse and small cultivator should be used.

When erecting the fences in rows of yards similar to those at Werribee, portion of the fence at both ends of each yard should be

made of 3 inch by 1 inch battens, 7 feet wide and 6 feet high. These can be held in position by wire pins, and may be easily removed to permit a horse and cultivator to pass through. With all the hurdles removed, there is a clear passage from one end of the pens to the other, and the cultivator can be driven up one pen and down the next, and finally the passages cultivated the same as headlands in a field. The twenty-four yards at Werribee can be done in under three hours, whereas the digging of them probably would take three days.

A House which may be used as a Breeding Pen.

The class of breeding pen illustrated below would be found suitable for housing up to twenty layers. Such pens have proved very satisfactory at the Werribee Research Farm, and they may be inspected there at any time by appointment.

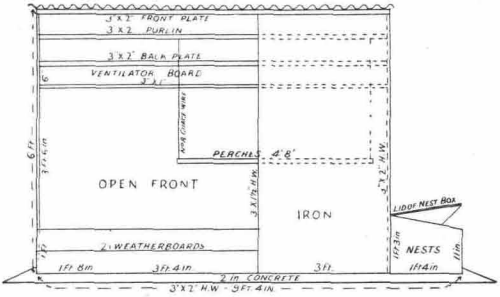


Plan of Poultry House and Yard suitable for Breeding Pen or to House Twenty Layers.

Material Required.

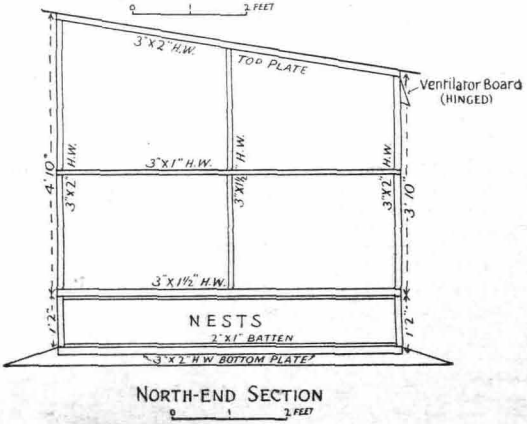
If desired, such a house may be built simply. The material required is as follows:—

Size of house—8 feet by 6 feet, 6 feet high in front, 5 feet at back.
Blocks—4 x 4 red gum.
Floor—*Concrete*, 2 inches.
Bottom and top plates—3 x 2 hardwood.
Purlin—3 x 2 hardwood.
Corners—3 x 2 hardwood.
Studs—3 x 1½ hardwood.
Battens—3 x 1 hardwood.
Perches—2 x 1 hardwood.
Ventilator—Weatherboard pine.
Lid of nest box—Weatherboard pine.
Back and ends—Plain galvanized iron, 26 gauge.
Roof—Corrugated galvanized iron, 26 gauge.
Nests—Kerosene or petrol tins.



FRONT ELEVATION

0 1 2 FEET



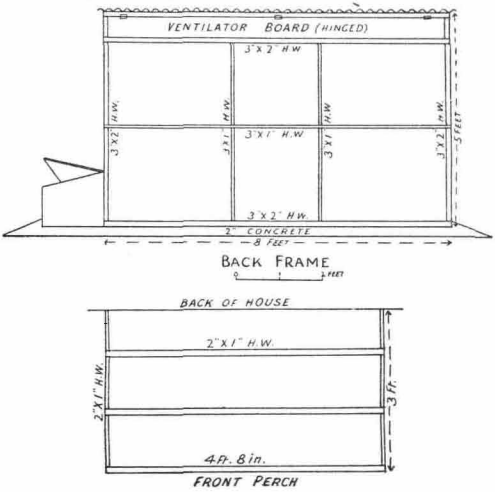
NORTH-END SECTION

0 1 2 FEET

METHOD OF BUILDING.

If the frame is built, and the iron put on inside of the back and sides, very little harbour is left for vermin to breed in.

A portion of the front (a width of three feet) is enclosed with a sheet of iron 6 ft. x 3 ft. The remaining five feet is boarded up one foot, two weatherboards being used so as to confine the scratching material and prevent waste.



Roosting Frame.

This should be suspended from the roof by a piece of No. 8 fencing wire passed through holes at each of the four corners, so that all perches may be on the same level. The two projecting ends are to prevent the perches swinging against the back of the house.

The frame may be made from 2 in. x 1 in. hardwood battens. It should be given two coats of hot tar; this will fill up all crevices in which vermin are likely to breed.

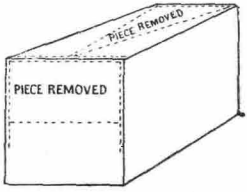
A dust bath is constructed by fixing a piece of corrugated iron 6 ft. by 1 ft. on edge, eighteen or twenty inches from the wall farthest from the nests. In this should be placed from six to eight inches of sand and ashes. The rest of the floor should have six inches of scratching material spread over it.

The perch frame shown in the sketch is large enough for twenty birds, and if suspended from the roof 2 ft. 6 in. from the floor by four

pieces of wire, there will be no obstruction on the floor to broom or scraper used by the attendant when cleaning the house. All perches should be at the same level, and not less than two inches wide, and they should be removed at intervals and painted with tar oil or sheep dip, to prevent vermin breeding in the crevices.

Shade for Poultry in the Yard.

Shade trees should be planted in the yards. Several varieties have been planted in the poultry yard at the Research Farm, but the most satisfactory one is the boobialla or boobyalla (also sometimes spelt bubeala). In two and a half years they attained a height of 5 feet and as many feet in diameter. They are covered with dense foliage all the year and are very hardy, and can be pruned to any shape desired. It is necessary to place a guard round them for the first twelve months to protect them from the birds. After that they will hold their own.



Nest Made from Kerosene Tin for Poultry House.

Cut tin along dotted lines, remove the three-corner piece on the top and bend the rest upwards. Remove the piece at the end and then cut the end down a further 2 inches, and bend this 2 inches over the 2 in. x 1 in. batten shown in the plan of end section.

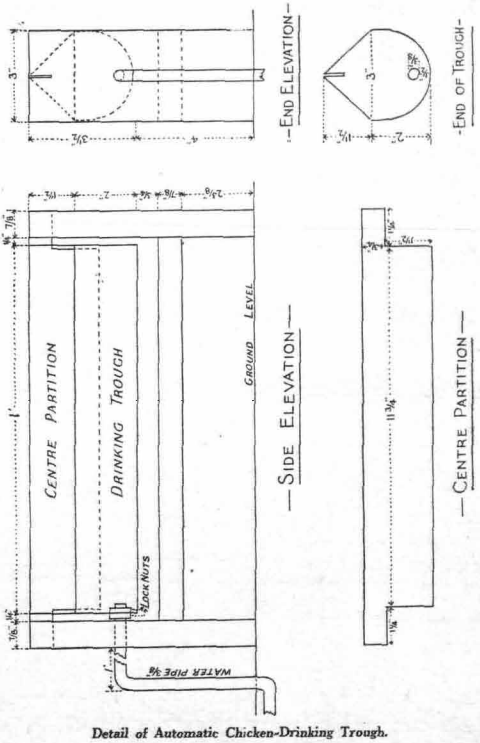
Six tins will be required.

Brooder House.

Where it is intended to rear a large number of chickens, a brooder house is necessary, and any building required for this purpose should, in Victoria, face the north. The reason for this is that the best time to carry out breeding operations is during the months of July, August, and September. At this time of the year, not only the nights, but many of the days, are very cold, and it is desirable to get as much sunlight into the house as possible. With the building facing the north and the windows built-in low down, it is possible to get the sun on the floor during the greater part of the day in fine weather, whereas, if the building faced east, the interior would not get any sun after about eleven o'clock in the day.

The brooder house at Werribee is 60 feet long, 15 feet wide, 7 feet high in front and 8 ft. 6 in. at the back. It has twenty windows let in the front wall 1 foot from the ground, and five windows in the back wall close to the roof; these windows are 3 feet by 2 feet. As the pitch

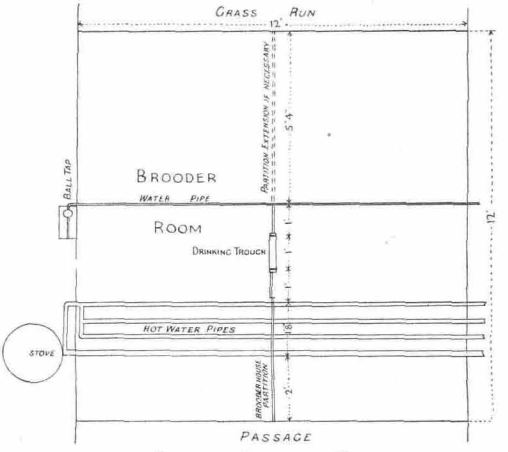
of the roof is from the back to the front, the fresh air comes in at the windows in the front, but above the chickens, and the bad air is drawn off by the windows at the back near the roof.



Detail of Automatic Chicken-Drinking Trough.

This house is partitioned off into five rooms and will accommodate 2,000 chickens. In front there is a yard 35 feet long, which can be subdivided by temporary hurdles and the chickens given a run on the grass when the weather is fine.

It is very necessary to keep the soil in this yard in good sanitary condition. After each breeding season it is sprinkled with lime, ploughed in, and allowed to sweeten by exposure to the sun and air till midwinter, when it is sown with rye grass; the growth of this not only helps to purify the soil, but provides a nice green pick for the chickens in the spring.



—PLAN OF BROODER HOUSE—

AN AUTOMATIC WATER SUPPLY FOR THE BROODER HOUSE.

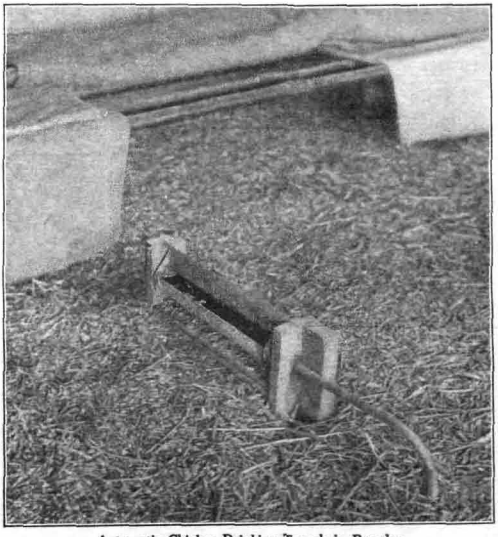
Some time ago, an automatic drinking water system for chickens was installed in the brooder house at the State Research Farm, Werribee, and has worked satisfactorily. Details of the method of construction are given below:—

The trough is made of galvanized iron, and measures 1 foot long by 3 inches wide by 2 inches deep. The ends are 1½ inches higher than the sides, and are brought to a point. A slot is placed in the top at each end, so that a centre partition may be fitted into it. The ends of this partition also fit into slots made in the wooden uprights, described below, so as to hold the trough in place. At one end of the trough a pin is soldered, which fits into the wooden upright, and to the other end the water pipe is attached and secured with locknuts, together with a leather washer.

The trough is supported between two wooden uprights each 7½ inches high, 3 inches wide, and ⅞ inch thick. The uprights are fixed to a cross-piece 12½ inches long, 3 inches wide, and ⅞ inch thick. The

cross-piece is placed 2⅜ inches above the ground level, i.e., ⅜ inch below the bottom of the trough.

The water is supplied through a cistern with a ball tap along a ¾-in. pipe below the ground, and then from the latter through a ¾-in. pipe to the trough. The pipe enters the trough ½ inch up from the bottom; and, if the cistern is placed at the correct level, the water automatically reaches a height just a little below the top of the trough. In the early stages a temporary step is provided to enable the chickens to reach the water.



Automatic Chicken-Drinking Trough in Brooder.

The trough is placed about 1 foot away from the hot-water pipes, and fixed to the brooder-house partition. This partition is shown in the plan as extending only just across the pipes, but when a large number of chickens is to be accommodated it is completed by placing a temporary hurdle right across the brooder house. The drinking trough then serves two lots of chickens.

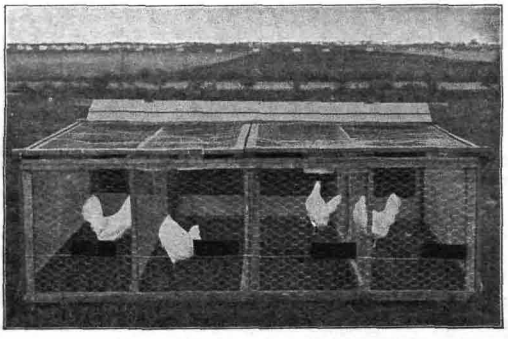
When the trough is to be cleaned, the centre partition is removed, the inside locknut loosened, and the trough turned over on its side.

IX.—TESTING BIRDS.

A Cheap Pen for Single-Testing Hens.

To lay the foundation of a profitable flock of birds for egg production, it is necessary to determine accurately the individual capability of each bird to be used in the breeding pen. For this purpose, trap-nests of various kinds have been used more or less successfully, but the single pen system is undoubtedly much superior.

To many poultry breeders the drawback to this system has been the high cost of erecting the required number of pens. This difficulty can be overcome by using a coop like that illustrated below, which combines usefulness, simplicity, and low cost of construction.



Front View of Pen.

This coop is for the single penning of 4 birds; it is 8 feet long, 2 ft. 10 in. wide, 3 feet high in front and 2 ft. 6 in. at the back, and is partitioned into four divisions, each 2 feet wide.

Running out from these partitions is a set of five hurdles 6 feet long and 2 ft. 6 in. above the ground with another hurdle 8 feet long and 2 ft. 6 in. above the ground across the front to complete the enclosure; the whole is covered with a wire-netting frame, to ensure each bird remaining in its own compartment, and each compartment contains 6 square feet under cover and 12 square feet in the yard. Thus, each bird has 18 square feet, which is equal to the space allowed in the single pens used in the Burnley competition and at the Research Farm, Werribee.

The hurdles forming the yards are held in position by hoop iron sockets attached to the coop into which the projecting ends of the rails are inserted, and the corners of the yards are held securely by loops of wire through which a wire pin is passed. The size of the coop has been limited to accommodate 4 birds, so that with very little time and labour it may be detached and re-erected on fresh ground.

Material required for a coop to single test 4 birds:—

88 ft. 3 in. of 2 x 1 hardwood.
42 feet of weatherboard.
65 feet of 16-gauge wire.
4 ft. 8 in. of 1 in. hoop iron.
3 square yards wire netting.
2 pairs of small hinges.
50 square feet of ruberoid, 2-ply.
4 kerosene tins for nests.

Material required for the hurdles:—

150 feet of 2 x 1 hardwood
36 yards of wire netting 3 feet wide.
1 kerosene tin to cut 4 feed troughs.

Method of Construction.

Cut up the 2 x 1 hardwood as follows:—

2 pieces 9 feet long.
3 „ 8 feet „
2 „ 2 ft. 11 in.
3 „ 3 feet.
2 „ 2 ft. 5 in.
3 „ 2 ft. 6 in.
5 „ 2 ft. 8½ in.
2 „ 2 ft. 7½ in.

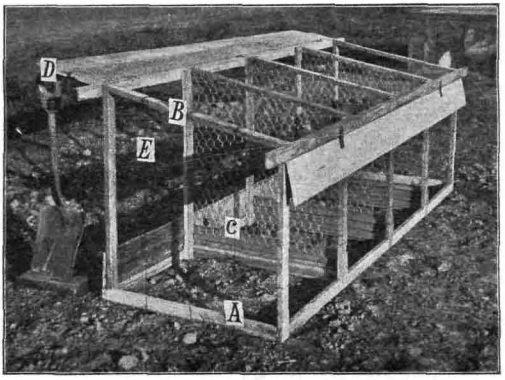
Then cut the weatherboard into 4 pieces 8 feet long, and 3 pieces 2 ft. 8½ in.

To make the front of the coop, lay out one of the 9 feet lengths of 2 x 1, and one of the 8-ft. pieces, 2 ft. 8 in. apart; nail a 2 ft. 11 in. piece at each end of the 8-ft. piece, and to the 9-ft. piece 6 inches from the end and one inch from the top edge; next lay the 3 pieces of 3-ft. at equal distances between these two and nail them on; turn this frame over and nail on a piece of 8-ft. weatherboard just above the bottom batten; this completes the front frame of the coop.

To make the back, lay down two 8-ft. lengths 1 ft. 7½ in. apart, then lay a piece of 2 ft. 5 in. at each end, and the 3 pieces of 2 ft 6 in. at equal distances between the first two, mark them and scarf out the pieces

to make a flush joint to which to nail the ruberoid. The 9-ft. batten is to be nailed at the top of these short pieces, allowing 6 inches to project at each end; to it hinge an 8-ft. piece of weatherboard to complete the back frame of the coop. This weatherboard is used as a ventilator board in hot weather.

Now stand these two frames up and join together at the bottom with one of the 2 ft. 7½ in. pieces, A, at each end; then nail on the 5 pieces of 2 ft. 8½ in., B, to carry the roof, keeping them flush with the top rails of the frames; then take the 3 pieces of weatherboard 2 ft. 8½ in. long, C, and nail on to make the bottoms of the three partitions; complete these 3 partitions with wire-netting. Next, take the two remaining pieces of weatherboard, D, join together by nailing on 3 cleats, and hinge on to the top of the front of the coop; this will rest on the



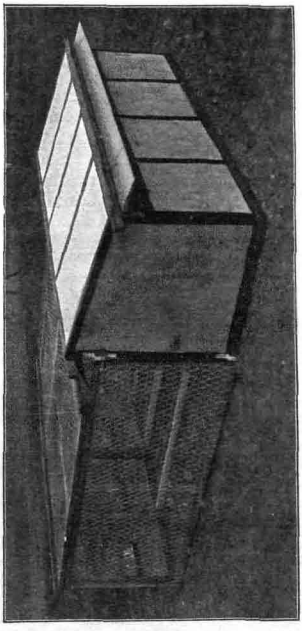
Showing how Back Portion may be Constructed.

hurdles of the yards and act as a verandah to prevent rain beating in on the birds; it is also convenient to lift up to enable the attendant to gather the eggs, to fill the water pot, and to catch the birds if necessary. The 6-inch pieces of batten projecting at each end of the coop are used as hand holds when it is desired to move the coop.

Next take the 16-gauge wire, E, and put up 3 rows at each end and the full length of the roof, about 8 inches apart, and 2 rows along the back at equal distances apart; these wires are to support the ruberoid and to prevent it sagging, and should be stretched fairly tight. Then cut 7 pieces of hoop iron, 8 inches long, bend these into the shape of a socket to receive and hold in position the projecting ends of the rails of the hurdles. Nail one of these sockets on to the left hand side of

each of the centre partitions at the height of the hurdle, and 2 more sockets on the outside of each end of the coop at the proper distance to receive the top and bottom rails of the outside hurdles. The ruberoid can now be securely nailed on to the roof, sides and back.

The nests, made from kerosene tins, should be hung on the wire netting partition nearest each end, and the bottom of the tin should be



Side View of Pen.

16 inches from the ground. The perches should be made of 2 x 1 hardwood on the flat the full width of the compartment and should have a hook in each end, so that they may be hung on the wire-netting partitions, and easily removed, when necessary, for examination for vermin. These perches should be hung 18 inches from the ground and 14 inches from the back of the coop.

All perches should be given a coat of hot tar to fill up any cracks in the timber to prevent vermin from breeding there.

The floor of the coop should be covered with scratching material to a depth of 4 or 5 inches: Cocky chaff or short straw is best.

The timber for the hurdles should be cut as follows:—

1 piece	of 2 x 1	8 ft. 2 in.
1 ,,	,,	7 ft. 10 in.
7 pieces	,,	6 ft. 3 in.
3 ,,	,,	6 feet.
5 ,,	,,	2 ft. 6 in
8 ,,	,,	2 ft. 9 in.

One end of each of the 8 pieces of 2 ft. 9 in. should be pointed, so that they can be easily driven into the ground.

To make the hurdles, lay the 8 ft. 2 in. and the 7 ft. 10 in. lengths 2 ft. 2 in. apart. Then take 3 pieces of 2 ft. 9 in. and nail one to each end of the 7 ft. 10 in. piece and one in the centre; then nail these to the 8 ft. 2 in. piece, allowing 2 inches to project at each end. This hurdle is to go across the ends of the yards. Then take 2 pieces of 6 ft. 3 in. and lay them down 2 ft. 2 in. apart; nail a piece of 2 ft. 9 in. to the right hand ends; next take a 2 ft. 6 in. piece and nail on 3 inches from the other ends; these projecting ends of the top and bottom rails are inserted into the hoop iron sockets attached to the left hand side of the coop. Take two more pieces of 6 ft. 3 in. and proceed as before, but nail the 2 ft. 9 in. piece to the left hand ends; this hurdle fits into hoop-iron sockets attached to the right hand side of the coop. Next lay out a 6 ft. 3 in. length and one of 6 feet 2 ft. 2 in. apart, and nail a 2 ft. 9 in. piece on the the two ends, and a 2 ft. 6 in. piece to the end of the 6-ft. piece and 3 inches from the end of the 6 ft. 3 in. piece; the end of this rail is inserted into the hoop-iron socket in one of the partitions, and the bottom of the hurdle is held in position by two cleats of wood nailed to the bottom of the coop. Three of these hurdles are required.

To hold the hurdles together at the corners a neat fastening can be made as follows:—Bore two small holes through the upright batten of one hurdle 9 and 10 inches respectively from the top, and one hole through the upright of the other hurdle 9½ inches from the top. Take three short pieces of 16 gauge wire and bend them into the shape of three hairpins; push the double end of one through each hole (leaving a loop ¼-inch in diameter), bend the ends over and secure with a small nail to prevent them pulling out. When the hurdles are erected in position these loops will be in line; through the three loops pass a pin made of No. 8 fencing wire, or else a 3-inch nail; this will hold the corners securely together.

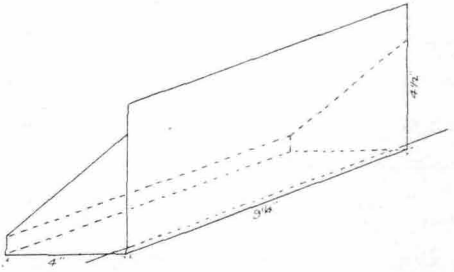
Cut the timber for the hurdles to cover the yards as follows:—

Four pieces of 2 in. x 1 in., 5 ft. 2 in. long.
Two pieces of 2 in. x 1 in., 4 ft. 2 in. long.
Two pieces of 2 in. x 1 in., 4 feet long.

Make these into two hurdles, one 5 ft. 2 in. by 4 ft. 2 in., and the other 5 ft. 2 in. by 4 feet. Cover all hurdles with wire-netting. These hurdles do not require any fastening as their own weight will hold them in position.

Feed Troughs.

Four feed troughs can be cut from one kerosene tin. The bottom of the trough should be cut 5 inches to allow of 1 inch being turned up to make the front, a piece of No. 8 fencing wire should be passed through a hole punched at each end of the trough at the angle.



A Feed Trough for the Pen.

A piece of wire netting should be cut out large enough for the trough to be fitted in, and the No. 8 fencing wire fastened to the netting. The trough will then fold outwards so that feed can be put in, and its own weight *should cause it to fall back into position.*

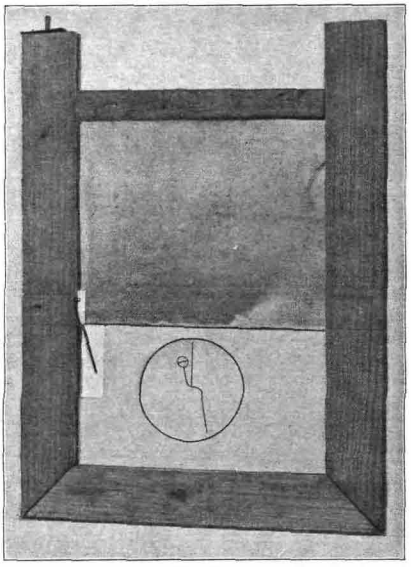
Water vessels may be hung under the weatherboard verandah where they will be sheltered from the sun's rays, and be in a position convenient for filling.

Trap-Nesting.

A poultry farmer breeding for prolific egg production cannot attain his object unless he knows exactly what return is being obtained from individual birds. Single penning is undoubtedly the most accurate

method of finding this out, but the high cost of building material is a bar to a great many poultry breeders erecting the required number of pens.

The most economical way to ascertain the best layers in a flock is to trap-nest pullets for the first twelve months, and any birds not showing a satisfactory tally can then be culled out. By using trap-nests the breeder is enabled to identify the good layer, the bad layer, the



Trap-Nest.

hen that lays the tinted egg, the badly-shaped egg, the thin-shelled egg, the small egg, or the double-yoke egg, and the hen that eats her egg.

The illustration above shows a trap-nest front similar to those used at the egg-laying competitions at Burnley, which can be recommended because they can be cheaply and easily made by any one handy with a hammer and saw. It consists of a sliding door made from one side of a kerosene tin. When set, it is held in position by a piece of wire

bent as illustrated in the inset. It should be set at such a height that the hen on entering the nest takes the weight off the door and releases the wire, thus allowing the door to slide down gently over the hen's back. To set the doors open 4½ inches for light breeds, and 5½ inches for heavy breeds, has been found satisfactory. Trap-nests have been in use at the Werribee Farm, and have answered the purpose well. Sets of four nests are used for pens of 6 birds. If constructed as described, plenty of ventilation is assured even on the hottest day, and the roof projecting a few inches protects the nests from the weather.

It is advisable to place the nests in the yards a week or two before the birds start laying; this will give them confidence. Instances of pullets laying outside sometimes occur, but, if the offender be caught and placed in the nest once or twice, there is not likely to be any further trouble. It has been found that every two hours is sufficient to visit the trap nests, but it is advisable to place them in the yards in such a position that they can be readily seen by the attendant whilst engaged in his ordinary duties. These trap-nests are invaluable in the breeding pen for the identification of the eggs laid by previously tested hens. The egg can be marked with the hen's number at the time it is laid. It can be hatched separately and the chicken branded; if a cockerel, it will assuredly command a better price coming from a tested hen; if a pullet, it may be tested, and the result should be of value to the breeder in mating his birds during the following year.

MATERIAL REQUIRED FOR SET OF FOUR TRAP-NESTS.

2-in. x 1-in. Oregon.

4 pieces 4 ft. 10 in. long.
2 pieces 2 ft. 4 in. long.
2 pieces 2 ft. 1 in. long.
6 pieces 1 ft. 3 in. long.
2 pieces 1 ft. 4 in. long.
2 pieces 1 ft. 10 in. long.
5 pieces 1 ft. 1½ in. long.
3 pieces 1 ft. 11 in. long.

4-in. x ½-in. Rough Lining.

7 pieces 5 ft. 3 in. long.
1 piece of ruberoid 5 ft. 3 in. x 2 feet.
4 kerosene tins.
4 trap-nest fronts.

Method of Constructing.

Lay two pieces of the 4-ft. 10-in. on bench 15 inches apart, nail on two pieces of 2-ft. 1-in., one at each end, then nail on three of the 1-ft. 3-in. pieces at equal distances, as in Fig. 1; this will form the back. Lay the other two pieces of 4-ft. 10-in. on bench 15 inches apart,

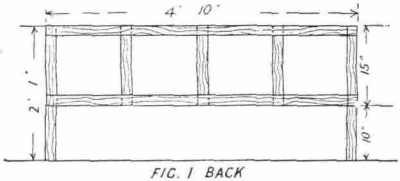


FIG. 1 BACK

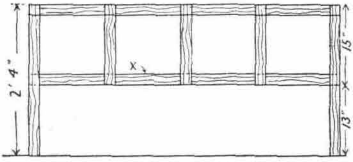
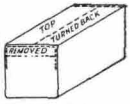


FIG 2 FRONT



KERO. TIN
FIG 4

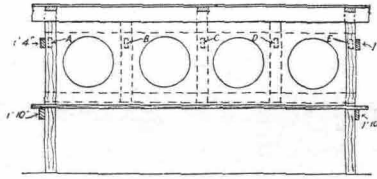
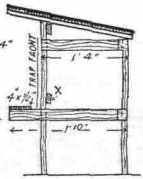


FIG 3 ELEVATION



SECTION

Plan of a set of four trap-nests.

nail on the two pieces of 2-ft. 4-in., one at each end, and nail on the other three pieces of 1 ft. 3 in. at equal distances, as in Fig. 2; this will form the front. Take the two pieces of 1-ft. 4-in. and nail on to back at the top and on to the front 3 inches from the top; then nail

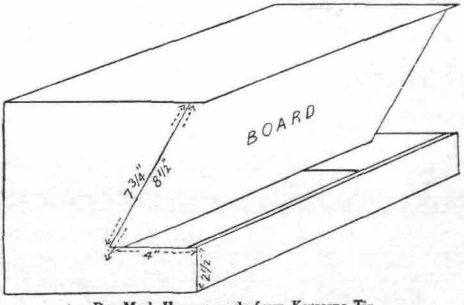
on the two pieces of 1-ft. 10-in., allowing 6 inches to project in front to carry the step (Fig. 3). Then nail on the five pieces of 1-ft. 1½-in. at equal distances, as shown in Fig. 3, A, B, C, D, E. To these pieces the kerosene tins, which will form the nests, will be nailed. Cut kerosene tins along dotted lines (Fig. 4). Remove the small piece at the end dotted round, and cut down 2 inches on each side where indicated by dotted lines. Then cut right down dotted line along top and bend upwards; fit tins into frame and tack sides on to A, B, C, D, E, Fig. 3. The piece of tin which has been cut down 2 inches in the front should be bent over the piece of timber marked X in Fig. 3 and tacked down. Fix on trap-nest fronts; then take six pieces of 4-in. x ½-in. rough lining 5 ft. 3 in. long and nail together with the three pieces of 2-in. x 1-in. 1 ft. 11 in long; nail this on to nest frame, and cover with ruberoid or other waterproof covering; this roof overlapping gives protection from the weather. The remaining piece of 5-ft. 3-in. lining is for the step.

X.—HOME-MADE UTENSILS.

Hoppers for Feeding Dry Mash.—Simple Methods of Making.

1. From Kerosene Tins.

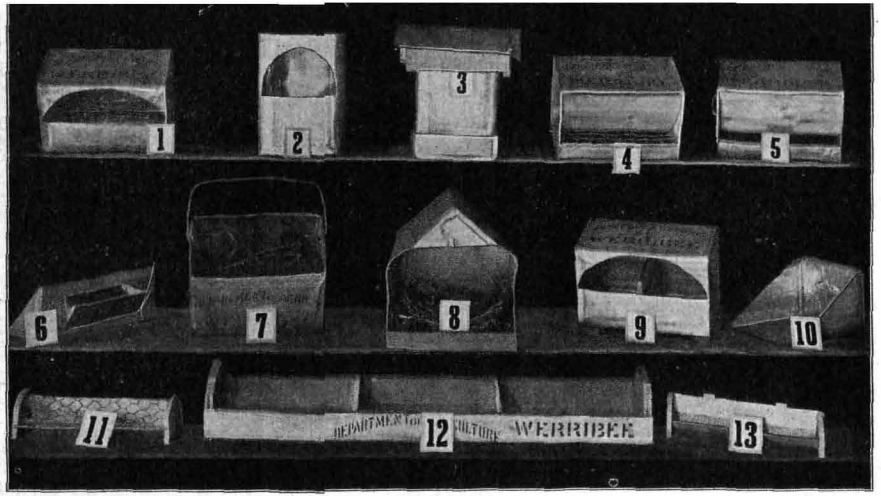
Cut tin along part indicated by dotted lines on diagram. Turn edges and hammer smooth and turn half-an-inch of front inwards to form a lip to prevent birds pecking the food over the front and wasting it. Cut a piece of thin board (portion of a kerosene case will do) to fit



Dry Mash Hopper made from Kerosene Tin.

neatly where marked; the bottom edge of this board should be half-an-inch lower than the front of trough, and it can be held in position by a few nails driven through the tin round the edge of the board.

To fill the hopper place it on its back and place some dry mash in it, and shake mash to the top and repeat till full.



1, 2, and 3.—Water founts. 4.—Dry mash feed hopper for chickens. 5.—Dry mash feed hopper for fowls. 6.—Folding feed trough. 7 and 8.—Nest for laying hen. 9.—Shell grit and charcoal holder. 10.—Dust-pan. 11.—Feed and water trough for chickens. 12.—Feed trough. 13.—Feed and water trough for chickens.

When using a hopper of this kind for small chickens, fix a piece of wire netting of an inch and a half mesh across the trough. The chicks will feed through the netting, and will be prevented from getting into the food and scratching it out.

XI.—FEEDING.

The Use of Automatic Hoppers.

THE FREE CHOICE SYSTEM.

The free choice system of feeding pullets has been thoroughly tested at the Werribee Research Farm for five years, and has given very satisfactory results. It has proved to be labour-saving, economical in cost of food, and the birds have consistently laid profitable numbers of

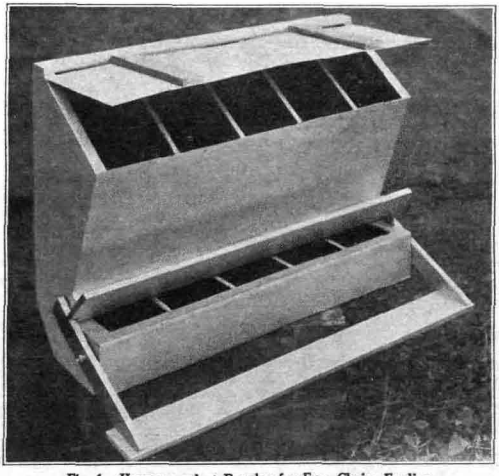


Fig. 1.—Hopper used at Burnley for Free Choice Feeding.

eggs. The breeds experimented with were Australorps and White Leghorns, and at no time have any birds shown a tendency to become overfat. At all times they were in excellent health, and came through the moult evenly and rapidly, and in excellent condition for breeding purposes during the succeeding season.

Under the free choice system the several varieties of food are placed in different hoppers, and they are available to the birds all day.

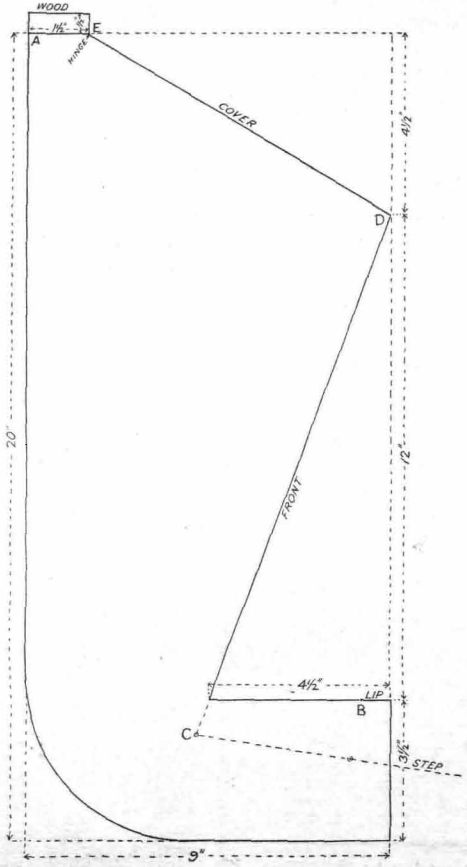


Fig. 2.—End of Hopper shown in Fig. 1.

Each variety can be weighed, and the actual consumption recorded from month to month. Foodstuffs can be chosen from:—

MEALS.—Bran, wheat pollard, oat pollard, maize meal, dried buttermilk, meat meal.

GRAINS.—Wheat, oats, maize, barley.

Constant supplies of succulent greenstuff are essential. It should not be chaffed, and if it is placed in a wire-netting basket the birds will pick it out as they require it. Shell grit and charcoal also should be provided.

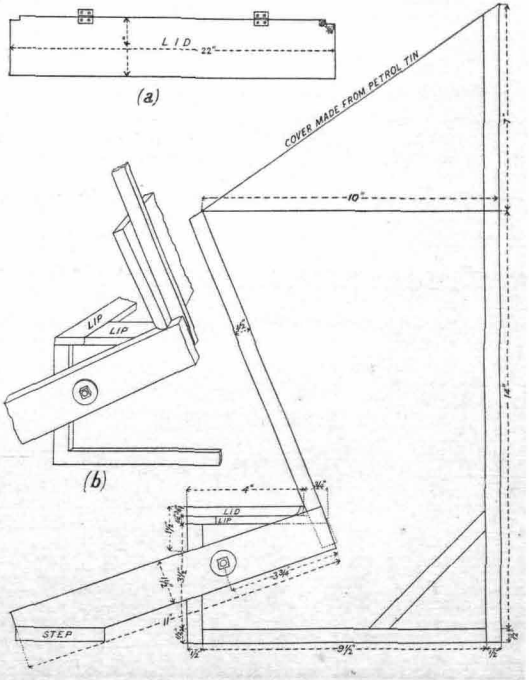


Fig. 3.—Plan of Automatic Hopper.
(*a*) Lid. (*b*) Step.

Dry Mash Feeding.

There are many mixtures fed to fowls as dry mash. Some ready for immediate use are sold by various poultry-food suppliers. The following has been found to give satisfactory results:—Bran 12 lb., wheat pollard 20 lb., oat pollard 4 lb., meat meal or dried buttermilk 3½ lb.

It should be available to the birds at all times. In addition, a grain ration made up of wheat three parts, oats and maize one part each, must be given every afternoon. Greenstuff should be fed at mid-day and after the grain. In the winter it should consist of mustard, rape, prairie grass, rye grass, or milk thistles, and in summer time it may be any of the following:—Lucerne, silver beet, lettuce, cauliflower, cabbage leaves, green maize.

How to Make a Hopper.

The hoppers in use at Burnley Egg-laying Competitions are very simple to make. An illustration of one appears on page 127, Fig. 1. Fig. 2 shows the shape of the end of the hopper. The two ends are made of wood, and the remainder consists of three pieces of plain iron. One piece covers the back, bottom, and front of the feed-trough from A to B; the second piece covers the front from C to D; and the third forms the cover from D to E, and is hinged on the top to a small piece of 1½-in. x ½-in. timber. This hopper is usually about 20 inches long, but can be made any length, and can be partitioned off if required. The automatic step can be attached as shown in Fig. 3.

A very simple hopper can also be made from kerosene or petrol cases. The main part of the hopper is made from one case; the top section consists of a quarter of a case, cut on the angle so that the birds cannot roost on it.

It may be hung on the wall about 2 feet from the ground, and when *the fowls jump on to the step the lid of the feeding trough will open.*

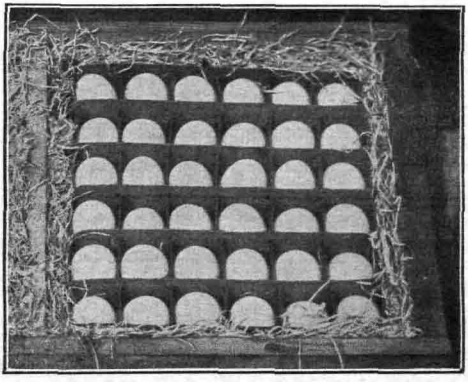
A narrow lip about 1 inch wide is placed round the feeding trough to lessen the wastage of feed. An endeavour should always be made to construct the hoppers in such a way that waste of food will be reduced to a minimum. If some kind of automatic lid to the feed box is not provided, sparrows in the day time and mice and rats at night will eat large quantities of the feed.

XII.—MARKETING.

Every consumer in Victoria has the *right to expect the protection of* the Health Act when purchasing food of any description. The public can purchase a pound of butter, tea, sugar, or a pint of milk with confidence that it will be of certain quality and certain weight or measure.

Why? Because the vendor knows that, if the article is not of the quality, weight, or measure demanded, he is liable to prosecution, but with eggs it has been very different. If the vendor is not an honest man, and the buyer taxes him with selling bad or inferior quality eggs, he disclaims responsibility. If he is an honest trader, and I am glad to say most are, he will replace the bad eggs with good ones, and shoulder the loss. But the majority of consumers who are unfortunate in buying bad eggs *do not bother to return the eggs; they simply want to forget* about them, and they refrain from purchasing any more.

When efforts have been made in the past to have eggs sold on a quality basis, it has been pleaded that it is too difficult to define quality in eggs. However, I think that if an egg is not good enough for boiling

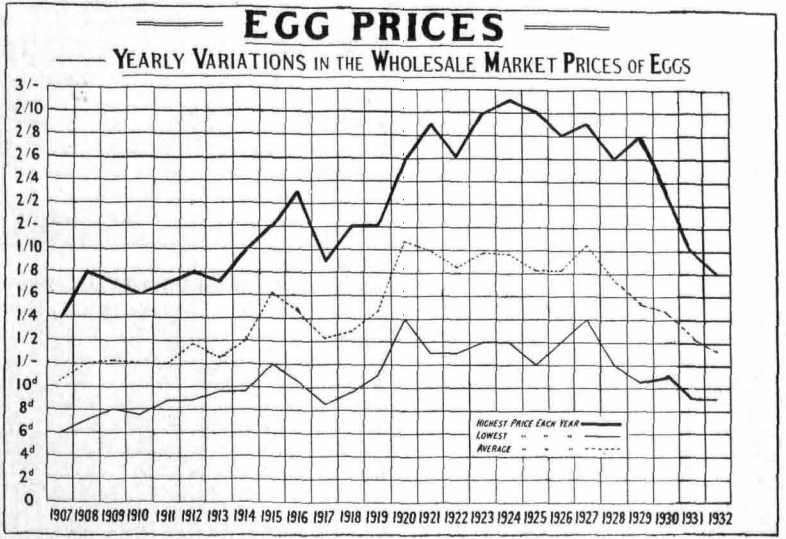


How Eggs should be Packed for the Local Market.

or poaching for a baby or an invalid, it should not be offered for sale at all, and if a grower cannot market eggs of good quality, he should be compelled to take up some other occupation.

With the introduction of legal standards for the sale of all eggs by quality and grade weights, the confidence of the consumers is being regained, and the increased consumption that will take place eventually will put the industry on the road to prosperity, as it has done in every country in which legal standards have been laid down.

The saleability of eggs depends on their appearance, colour, weight and freshness, and packing. Of these essentials, weight and freshness are of first importance, but the inclusion of dirty eggs considerably


EGG PRICES
YEARLY VARIATIONS IN THE WHOLESALE MARKET PRICES OF EGGS
3/-
2/10
2/8
2/6
2/4
2/2
2/-
1/10
1/8
1/6
1/4
1/2
1/-
10d
8d
6d
4d
2d
0
1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932
HIGHEST PRICE EACH YEAR
LOWEST
AVERAGE

reduces the value of a consignment. Eggs rapidly absorb any musty flavour that lingers round their packing material; hence the necessity of observing strict cleanliness in the care of the eggs from the nest to the consumer.

General experience in marketing various agricultural products has shown repeatedly that it is the producer who suffers from defective systems of marketing, and although the imposition of grades for weight and quality may during its introduction appear to harass the producer, yet finally it will be to his advantage.

The general quality is improved; the course of trade is facilitated; a reputation and goodwill are established. These are the beneficial results that will flow from orderly marketing of produce.

It is certain that the full commercial benefit of grading can be secured only by the adoption of standards strictly observed and easily understood by the public. A multiplicity of standards differing in small details hampers trade, confuses the consumers, and decreases the commercial advantages that should flow from the adoption of grading.

As England is likely to be for many years Australia's best customer for our surplus eggs, it would be in the best interests of the poultry industry if uniform grades were adopted throughout the Commonwealth for the sale of all eggs for local use as well as for export.

Buying and selling eggs on grade will do more to reduce costs of marketing than any single agency or reform. All engaged in the industry know, or should know, that, in marketing, it is the article that the consumer demands and for which he is willing to pay, that should be offered for sale.

Some time ago, I read an article by Dr. Ed. Brown, of England, on the "Fetish of High Prices." In it he says, "There may be five per cent. of our people who will have eggs, no matter what they cost, possibly another ten per cent. will continue to buy, but in lesser quantities. To the other eighty-five per cent. high prices mean inability to afford *the highest rates, and they go without or use substitutes.*"

As it is in England, so it is in Victoria. We all want to see producers get profitable prices for their eggs, but there must be consideration for the consumers who are masters of the situation. They cannot, and will not, be forced to buy.

The problem of the poultry industry to-day is not less production, but the marketing of products of higher quality and the stimulation of the consumers' appetite for eggs.

The programme of buying and selling eggs on the basis of quality and weight should receive the ardent support of every one engaged in the industry.

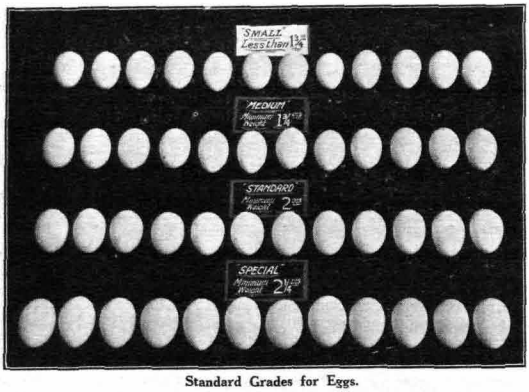
Grade Regulations.

Briefly, the provisions as to quality laid down in the regulations are that:—"No person shall sell any egg unless it is sound and wholesome; on candling the white is translucent and the yolk translucent or but faintly visible. The air cell must not exceed one quarter of an inch in

depth. Chilled eggs must be branded with the word 'chilled,' and the air cell must not be greater than three-eighths of an inch." Eggs must be sold in the following grade weights:—

"Specials" must weigh not less than $2\frac{1}{4}$ oz. each.
"Standards" must weigh not less than 2 oz. each.
"Medium" must weigh not less than $1\frac{3}{4}$ oz.
"Small," all eggs less than $1\frac{3}{4}$ oz.

The proprietor of any shop, stand, stall, &c., where eggs are sold is required to keep the various grades of eggs in separate receptacles and to affix to each a placard, on which shall be printed or written the grade of eggs in plain and legible characters plainly visible to customers. It shall not be deemed to be a contravention of the regulations if any egg sold or described as being a particular grade, weighs 5 per cent. below



Standard Grades for Eggs.

the weight prescribed, provided that any twelve eggs supplied to the purchaser weigh not less than twelve times the minimum weight of the grade asked for. The full regulations were published in the *Government Gazette* on 7th December, 1932, and are obtainable from the Government Printer.

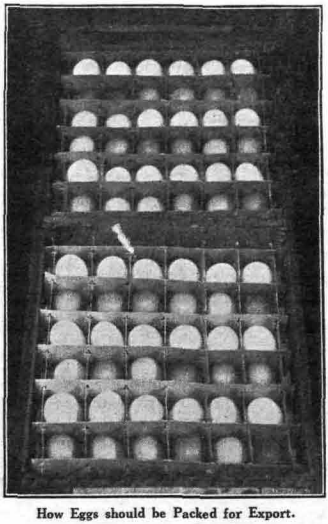
XIII.—COLD STORAGE OF EGGS.

The recognition by medical men and food specialists of the f values of eggs has resulted in a steady demand for this nourishing easily digested food; but it is possible no one thing has so gre benefited the poultry industry as the cold storage of eggs. M poultrymen will not agree with that statement; nevertheless it is true

If it were not for the cold storage of the surplus eggs produce the spring and early summer, prices for eggs during the winter w

be so high that none but the very wealthy could afford to buy them. The bulk of the people would be debarred from the use of one of nature's best foods, and it would be difficult for managers of hospitals to find suitable substitutes to give to their patients.

The producer benefits because during the time of high production thousands of dozens of eggs are taken off the market when prices are low, and this helps to stabilize the prices he receives.



How Eggs should be Packed for Export.

Unfortunately, a section of the people has the opinion that, once an egg has been placed in cool store, it becomes an inferior article, and should not be sold in shell, but should be converted into egg pulp. Nothing is further from the truth.

Managers of cool stores have advanced with the times, and are now able to hold many classes of foodstuffs in perfect condition over very long periods. As far as eggs are concerned, cold storage has been brought to a very high standard of efficiency. It must be remembered, however, that, as stated in a departmental circular, "by cool storing eggs miracles are not performed. It does not make stale eggs

fresh, or dirty eggs clean, or small eggs large, or cracked eggs sound; therefore, operations should be confined solely to sound, clean, new-laid, large eggs."

Provided eggs of this description are placed in store and the correct temperature maintained, they can be held for months, and when taken out will be in perfectly satisfactory condition; and no evidence has yet been produced that the food value of cold-stored eggs deteriorates in any way. Thousands of dozens are held at the Government Cool Stores for hospitals every year, and officials of some of these institutions have stated that eggs after seven months' storage have opened up in first-class condition, and in most instances it was impossible to tell them from new-laid eggs.

Unfortunately, in the past there have been good grounds for prejudice against some eggs that have been in cool store, and both consumers and producers have been exploited by unprincipled people. Dealers have purchased eggs that were laid in the hot summer months in the dry northern areas; many of them were storekeepers' collections, and were unfit for cold storing even before they were placed on the train. The sale of such eggs has been the main reason for a great falling off in consumption, and has led to a considerable decrease in income on many farms. Had this practice been allowed to continue, it would have been the ruination of the industry, and the health of many invalids, children, and the people generally would have suffered; but regulations have now been gazetted which demand that all eggs before removal from cool stores be tested for quality, and that an indication be given on the shells that they have been chilled, and such eggs must be sold according to grade weight.

The buying and selling of eggs on quality and grade weights should be supported by every progressive poultryman; this will do more to reduce the costs of marketing eggs than any other reform.

The regulations recently gazetted, if rigidly enforced, will do more for the poultry industry than any form of subsidy or bounty. If all poultrymen and retailers will stand loyally behind these regulations, the confidence of the consumers will be regained, and the increase in consumption that will assuredly follow will absorb all the eggs poultrymen can produce.

Nothing will be of greater help to the industry than the cool storage of eggs in times of glut. Poultrymen of Victoria are probably more fortunate than those in many of the other States, because of the fact that there are a number of cool stores conveniently situated, some of them privately controlled, the managers of which have had long experience in storing eggs.

In addition to these, there is the Government Cool Store at Victoria Dock, probably the largest and best equipped in the Southern Hemisphere. It contains over 90 chambers of nearly 1,500,000 cubic feet of

cold storage space, where produce of all kinds can be held at the correct temperatures for the particular commodity without variation month after month.

Many producers and others are not aware of the facilities provided at the Government Cool Store. Cold storage space is available for any person who likes to comply with the regulations, and is prepared to pay the storage charges, which are very low. Costs of storage can be obtained from the Exports Superintendent. A producer need not employ an agent unless he wishes, and he can consign his eggs direct to the Government Cool Store, Victoria Dock, which is a railway goods siding.

Eggs are received at the store for cool storage from the month of August. They must be clean, new-laid, free from cracks, and packed in cases without chaff or other material liable to taint them.

They should be packed in wood-pulp fillers, such as are supplied by Melbourne agents who sell eggs. These agents also supply suitable wood-wool. Five layers of fillers fit a petrol case, and wood-wool is placed on the top and bottom to prevent breakages in transit. This work can be carried out more economically on the farm, and possible breakages and repacking avoided. Cases should be free from kerosene or any other taint.

The cases should be clearly branded or labelled, "Government Cool Store, Victoria Dock," and also bear the name or mark of the sender. They should be consigned DIRECT to the store. At the time of dispatching, an advice-note giving particulars of number of cases, brands, &c., should be posted to—"The Manager, Government Cool Store, Victoria Dock, Melbourne. C.3."

It will be useless to send any eggs that do not comply with the following conditions:—

Cleanliness.—Eggs that are dirty in shell (no matter how fresh or full-sized) will be rejected. Therefore nests should always be kept clean. Washing eggs removes the "bloom," and their appearance is spoilt, also their keeping quality.

Freshness.—Eggs should be gathered twice daily and kept in a cool place not over 60 deg. F., and forwarded to the Government Cool Store twice a week if possible. The objective is an air cell not larger than a threepenny piece, or perhaps it would be clearer if we said about an eighth of an inch deep.

When the time arrives to take the eggs out of cool storage for consumption, it is advisable to remove them from the cool chambers 48 hours before they are to be tested and stamped. They should be placed in a room with a temperature not exceeding 50 deg. for this period of 48 hours. If this is done, very little, if any, condensation takes place on the eggs and fillers, and they will reach the customer

having a good appearance, and give greater satisfaction than if delivered direct from a temperature of 33 deg., when heavy condensation takes place, spoiling their appearance. If the manager of the store be advised 48 hours before delivery is required, the eggs will be transferred to a room at the suitable higher temperature.

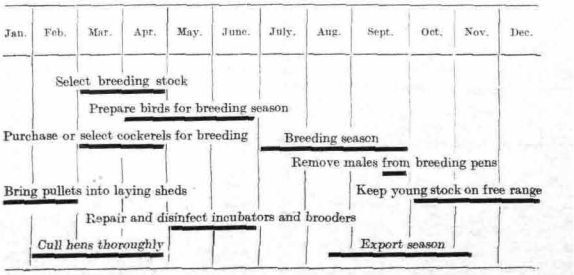
The most important thing for the producer to remember is that it is the condition of the eggs on admission to the cold store that is the deciding factor in their keeping quality.

It is well known that eggs laid by hens in spring and early summer will keep their quality better than those laid in the height of summer.

Eggs intended for cold storage should never be exposed to high temperatures. They should never be placed in sheds where the temperatures may rise to 80 deg. or 90 deg., or left on railway stations exposed to the sun; in fact, eggs should be looked after in the same careful way that a competent dairyman cares for his choicest cream—by keeping it cool and away from odours.

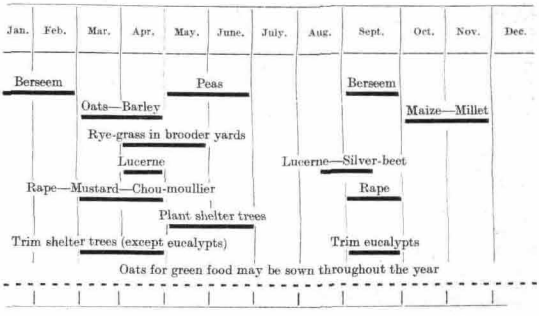
Possibly the greatest losses in cold store eggs are due to the eggs being washed. Washing, in most cases, is fatal to their keeping quality. If eggs are washed, the surface dirt only is removed, and the shells being porous, minute particles of dirt, and often excreta, are deposited in the pores; this may cause the growth of bacteria and mould under cold storage conditions, making the eggs unfit for consumption. Some Victorian poultrymen have had costly experience of this. Soiled eggs can be cleaned and disposed of on the local market without danger to any one, but in the interests of the whole industry the placing of such eggs in cold storage should be absolutely prohibited.

XIV.—CALENDAR OF OPERATIONS.



Clean pens regularly—don't waste the manure—sell it or use it to improve your land.
Keep perches and nests free from vermin—they check production.
"Continuous culling cuts cost."

When to Sow.



XV.—PREPARING POULTRY FOR MARKET.

An Ancient Practice.

The art of preparing poultry for the table was known to the ancient Romans. Pliny mentions the inhabitants of Delos as the first to prepare fowls artificially for the table. In all probability the artificial preparation was what is to-day called cramming, and there is no doubt the luxurious Romans ate crammed poultry extensively. Cramming of geese was also practised in ancient times by the Egyptians, as evidenced by tablets found in one of the pyramids of Sakkara which was erected about 4,000 years ago. References are also made by ancient Roman writers, notably Columella, showing that intensive feeding of domestic poultry before slaughter was extensively adopted in Italy nearly 2,000 years ago.

Yet any one paying a visit to the poultry auction rooms in Melbourne, and carefully examining the majority of birds that are offered for sale, must come to the conclusion that the proper preparation of poultry for table purposes is now one of the lost arts. One often wonders, when on rare occasions really good birds are put up for auction, whether buyers have any limit; they certainly don't seem to have. But they demand A1 quality.

High Prices Obtainable only for Well-fattened Birds.

High prices can be obtained only when the birds have been well fed and are marketed in the best possible condition; that is—clean and attractive, and free from faults and blemishes. By adopting better methods suppliers can give the buyers a better article, and so stimulate local consumption, which will mean higher prices for themselves.

With the rapid increase in population there is every reason to believe that the trade to be done in table poultry is capable of considerable expansion. But this expansion will never take place so long as producers follow the slip-shod methods that are common at present. All farmers know that, with their larger animals such as cattle, sheep, and pigs, good and plentiful feeding is an absolute necessity if the flesh is to be of the quantity and to have the quality desirable; yet the majority of the poultry-farmers send their birds to market while they are only half fat, and often so overcrowded in the crates that they reach the auction-room in anything but the right condition to attract the best buyers. Thousands of pounds are lost to producers each year in this way. To send a lean bird to market is a wasteful practice. With the improperly-fed bird the proportion of flesh to bone and offal is small, and the quality of flesh of half-fattened stock is distinctly inferior to that of the fattened.

The reason why fatted flesh is superior to unfatted is that globules of fat are distributed throughout the muscles, displacing to a great extent the moisture found therein. Not only, therefore, is the bulk increased, but, when the flesh is cooked, the fat does not evaporate to the same extent as the water, but as it melts it softens the tissue, making it more digestible and finer in flavour. I have found that young roosters of the heavy breeds, such as Australorps, Rhode Island Reds, Plymouth Rocks, and Sussex, bring the highest prices at the ages of 20 to 24 weeks. At this time they should weigh from 5 lb. upwards, and must be plump and straight-breasted. In light breeds such as Leghorns, the cockerels should be marketed at 13 to 15 weeks old, and should weigh about 2½ lb. If birds are allowed to get any older than the periods mentioned before marketing, their flesh loses much of its fine texture, and they are not sought by the best buyers.

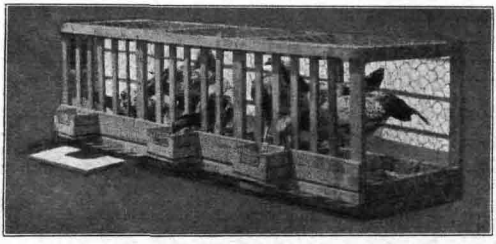
The Method of Fattening.

The best method of fattening fowls is to provide coops in which they can be confined, as it is not economical to feed heavily and then allow the birds to run off any condition one has put on them. These coops can be built 7 ft. 6 in. long, 20 inches broad, and 20 inches high, and may be divided into three compartments each of which will accommodate five or six birds, or fifteen to eighteen birds in all. These coops can be built of light battens 1½ inches apart, except in the front, where they should be 2½ inches apart, so that the birds can easily put out their heads for feeding. The bottom bars on which the birds stand can be made with specially cut wood 1 inch wide at the top, 1 inch in depth, narrowing to half an inch below, so that the droppings will fall through without catching on the sides, as would be the case if the bars were perfectly square. Alternatively, a wire netting floor can be put in.

These coops should be placed in a sheltered position. The main idea is to keep the birds warm and, to some extent, in the dark. Professor Warrington, in his "Chemistry of the Farm," says "Economy of food is promoted by diminishing the demand for heat and work." The temperature most favorable for increase of weight is about 60 deg. F. Quietness and freedom from excitement are essential for rapid

fattening; therefore it is not good policy to put the fattening coop near the motor garage or the dog kennel.

The nature of the food used is, of course, very important. What is called soft food is commonly used; that is, meals mixed with some liquid, preferably milk, into the consistency necessary according to the system of feeding adopted. Perhaps the best meals are oaten pollard and barley pollard, and, if of good quality, wheaten pollard, but most of the wheaten pollard on the market is useless for the purpose of fattening, as it contains too much straw and other rubbish. No doubt maize meal will add greatly to the bulk of the birds, but it forms a yellow oily fat, which is wasteful in cooking, and the birds so fattened are never so nice in appearance. The reason meal is such a good fattening food is that, when mixed with milk, it is much more easily digested than whole grain. To ensure successful fattening it is essential that the birds be kept in strict confinement; otherwise they will not increase in weight nearly so rapidly, and thus the organs of the body will not be in a condition to permit rapid assimilation of hard grain.



A Fattening Coop.

While a great deal of the success in fattening is due to the meals employed, the colour of flesh is largely determined by whether milk is used or not. The large amount of phosphates in the solids of milk secures the whiteness in flesh which is preferred in Victoria, and, in fact, nearly all countries except America, where yellow-skinned birds are often considered superior.

There are many methods adopted in preparing food for fattening. Many fatteners mix the meal with milk some hours before it is to be used, and allow it to stand; during this time, slight fermentation takes place which, it is claimed, assists the process of fattening. If only separator milk is available, it is an advantage to add mutton fat or butchers' suet. The fat and suet should be melted and mixed carefully through the soft food; otherwise it will be strewn through the food in lumps. Only a small quantity of fat should be given the first day or two, about 4 ounces to twenty birds, and the allowance may be gradually increased till each bird is getting about half an ounce per day. If

whole milk can be obtained it is not necessary to use fat. If birds have been well reared they can usually be got into prime condition within two to three weeks in the fattening coops.

They should not be fed until twelve hours after they have been placed in the fattening coop; thereafter they should be fed every twelve hours. The amount of food to be given varies with individual birds; the first feed should be as much as they will consume in about ten minutes; any that is left in the trough must be taken away. As their appetites improve they should be given all they will eat in from 20 to 30 minutes, and no more should be given for twelve hours. For the best results the birds must be fed regularly to the hour. It is, however, a good idea to feel the birds' crops, and if it is found that any food from the previous meal remains there, it is better to omit a feeding time. A good man can judge to a nicety the amount of food the birds can assimilate, and a great deal of the success of the work will depend on his judgment in this direction.

If any of the birds appear sickly and "go off" their food, it is useless to continue the fattening of them. If they are fairly well fatted, the best thing to do is to fast them immediately and kill them. If any birds "go off" their food in the early stages, it is better to remove them from the pens, put them in an outside run for a day or two, and feed a little hard wheat, when they will usually recover and can be returned to the pen for fattening. All birds should be kept without food for at least 24 hours before slaughter. It is well known that birds starved in this manner will keep much longer. Further, the flesh of fowls so fasted eats much better, and it is less liable to hardness. Another point is that the fowl starved in this way is much more easily drawn and is not so offensive during the operation.

The Fattening of Ducks.

It is not economical to fatten ducks specially for the Melbourne market if they have to be transported long distances by train. They are bad travellers, owing to their being very nervous, and are apt to be injured in the crate by rushing and crowding one on top of the other when frightened. However, much of this crowding can be avoided if a partition of hessian is put in the crate and only about eight or ten birds are put in the one compartment. Usually sixteen to twenty are placed in one crate, and, if no partition is put in, much damage to the birds sometimes occurs.

White ducks, Pekin or Aylesbury, or these breeds crossed, are more popular with buyers than the coloured varieties. They should be marketed at from ten to thirteen weeks old, at which time they should weigh from 5 lb. upwards. Muscovy drakelings should be marketed at sixteen to eighteen weeks old, when, if well fed, they will weigh 8 to 10 lb. Some of the coloured varieties, though small, have a very fine-flavoured flesh, notably Khaki Campbells—but Indian Runners are not popular as table ducks.

Ducks can be fattened on the same kinds of meals as have been recommended for fowls. They should be kept in small, shady yards. Very little water should be given them, and that for drinking only, and therefore it must be so protected that they cannot splash it about.

The Fattening of Geese.

Geese are not very popular in Victoria, and there is little demand for them except during later November and December for the Christmas trade. For this state of affairs producers are mainly to blame, because of the fact that too many grass-fed and small-framed birds are sent in for sale. If these birds were put up in pens bedded with straw, and liberally fed on oats and wheat soaked in troughs of water for a week or two, and "finished off" during the last week with oaten pollard and milk, and a little boiled barley, both quality and quantity of flesh would be greatly improved, and the result would be increased demand. Considering that geese get most of their feed in paddocks during their growing period, it would surely pay the farmer to feed them well for the last three weeks.

Before the war, enormous numbers of geese from Russia were exported to Germany. In an interesting report from the British Consul-General at Berlin, in 1909, he stated that a special "goose train" of from fifteen to forty cars arrived in that city daily from the Russian frontier, fitted specially for, and occupied solely by, this traffic. The figures showed that, in 1909, live geese to the number of 6,681,723 were imported into Germany from Russia; their value was given as £1,135,000. But the war finished this trade.

The Fattening of Turkeys.

Turkeys are now more popular than ever as table birds, although suppliers are losing a lot of money by marketing the majority of their birds in poor condition; those who send in good prime birds are receiving splendid prices.

When breeding turkeys for the Department, some years ago, I found that plentiful supplies of milk greatly improved the texture of flesh, and that in "topping them off" good results were obtained by soaking wheat and also oats in milk for 24 hours. Often slight fermentation takes place and the milk curdles, and the whole is much relished by the birds. In fattening turkeys, as with all other poultry, regularity of feeding is absolutely necessary.

A cause of loss to turkey breeders is the breeding of birds with crooked breasts. This matter is discussed on page 179.

How to Send Birds to Market.

I believe producers are losing thousands of pounds annually by the careless manner in which they despatch their birds to market. In some instances they are crowded into unsuitable boxes, sometimes badly ventilated; at other times into open boxes covered with wire-netting. Should these be left exposed to the sun on the railway station the birds suffer in comfort, lose condition, and the owner loses money.

The crates usually loaned to producers by auctioneers measure, approximately, 4 feet by 2 ft. 6 in., by 18 inches deep, and in those crates the following numbers of birds should be put and no more:—Hens or roosters, 20 to 24; ducks, 16 to 24; geese, 10 to 14, according to size; good turkey gobblers, averaging 20 lb. in weight, not more than eight

birds; turkey hens, not more than twelve. On many occasions these numbers are exceeded; no doubt suppliers think they are saving freight, but in many instances they are losing far more through deaths. Further, overcrowding and over-heating cause the birds to present a poor appearance on arrival at the auction-room.

Ducks, geese, and turkeys should always have a good bedding of straw or grass on the bottom of the crate.

At times the jolting and shunting of the train throws the birds down on their breasts, and in this way they are liable to get bruised and to have skin knocked off, and, the moment they do, down goes their value. Injured birds are no good for export, neither are they suitable for the best local trade; thus the birds are left for the second-class trade. It is an impossibility for the auctioneers to get high prices for these birds, no matter what weight they are.

Auctioneers always try to get the last shilling, but it is impossible for them to get high prices for birds with faults.

Breeders must remember that it costs just as much to produce these crooked-breasted turkeys as it does to rear sound-keeled ones. The freight, commission, and other expenses on half-fattened birds are just as great as on prime birds. Why go to all the trouble of putting an inferior article on the market when, by a little care and attention to the points mentioned, one can get a great deal more pleasure and profit out of one's business?

XVI.—PREPARING POULTRY FOR THE TABLE.

Killing.

Before killing, birds should be fasted for 18 to 24 hours, with only water to drink, so that the crop and digestive organs may be empty. Of all methods of killing, none is more clean and satisfactory than dislocation of the neck, when it is done properly. This is the plan followed by most poulterers.

When about to start the work of killing, take hold of the bird by the shanks and wings with one hand; then with the other hand take hold of the back of the head by placing it between the first two fingers; then close the hand on the head, and at the same time put the little finger under the bottom of the beak, which acts as a lever, and bend the head well back, giving a sharp pull, which will sever the vertebral column, and no pain will be suffered by the bird. The carcass should be held or hung with the head downwards, so that the blood from the body will drain into the neck cavity caused by the dislocation.

Another way of killing is to hang the bird up by the legs. Then pierce the brain by pushing a sharp-pointed knife through the roof of the bird's mouth into the brain, and then sever the jugular vein at the throat from the inside. Then let the bird hang with head down, so that the blood will drain out. As some birds have very soft skulls, the operator should, when sticking, be careful to point the knife so that he will not pierce his hand.

There can be no doubt that the flesh of bled birds is much better in colour and keeps better when cool-stored than that of the birds which are not bled.

Dry-plucking.

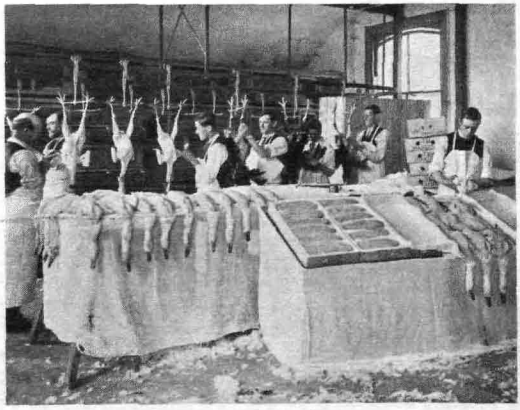
With most kinds of poultry this operation should be commenced immediately after killing, as the feathers come off readily when the body is warm. They should be removed against the grain of fowls and turkeys. A capable plucker will remove the feathers from a bird in a few minutes. Care must be taken not to tear the skin, as torn skin spoils the appearance.

Skill in plucking is acquired by experience.

Geese and ducks must be hung until cold, head downwards. When perfectly cold they should be plucked with the grain. When the feathers are off, the bodies should be singed so as to burn all the fine fluff and so-called hairs or rudimentary feathers that are left by passing the body quickly over a blue flame, gas or methylated spirits (newspaper discolours the bird).

Dressing.

Poultry for home use can be dressed as follows:—Turkeys and fowls, after plucking, must be hung till cold before drawing. First start by



Preparing Poultry for Export.

drawing the sinews. To do this place the bird on its back, and with a sharp knife cut the shank just in the front of the foot; then bend the foot back, and the shank will break. If it is an old bird, just hit it with a stick, and there will be no trouble to break it then. Get a piece of rope or wire, and make a loop. Suspend it from a hook, place the foot in the loop and pull hard, and the foot and sinews will leave the shank and the flesh of the legs when cooked will be more tender.

With a sharp knife cut the skin at the back of the neck, turn the bird over, remove the crop and neck, and pass the knife around the base of the neck to loosen the ligament or little arteries that hold the heart. In order to loosen any that have not been cut, one's forefinger should be run round the opening that has been made. Then hold the bird in such a position that the front of the breast and neck will be resting on the table. With a sharp knife, make an incision just between the tail and vent; pass your forefinger in and pull out the intestine that joins the vent, and cut it off. Then pass the forefinger down the side of the breast and remove a leaf of fat that connects the gizzard and the breast. If this be done, the intestines of the bird will come away freely. Sometimes there are little pieces left inside; these, of course, must all be removed.

The giblets can be cleaned and used for soup, &c. The bird can then be trussed with twine or skewer.

Poultry for Export.

Birds intended for export are killed by pushing a sharp pointed knife through the roof of the mouth into the brain; the bird is then held with its head downwards so that it will bleed well. It should then be plucked clean, only a few feathers being left on the head and neck. The intestines must be drawn through the vent; the gizzard, liver, and heart should be left inside. The head and feet should be washed down and left on the bird and tied down close to the body; the head should be wrapped in greaseproof paper, and when the birds are placed in a box the heads should be tucked in between the bodies, which are placed side by side.

The boxes are then put in the freezing chamber to be frozen, and are ready for shipment.

XVII.—DISEASES.

Their Prevention.

The principle that prevention is better than cure is especially applicable to poultry, because fowls are commonly kept in such large flocks that disease may spread very rapidly and cause considerable loss before it is recognized. The poultry-keeper should make a special study of the underlying principles of the subject of prevention at the very beginning of his career, for it may mean all the difference between success and failure.

Infectious diseases of poultry are due to micro-organisms, and when these gain entrance into the body and multiply in the organs, tissues, or cavities, and produce disease, an infection is said to occur, and the disease so produced is called an infectious one.

Infection may be brought on to the poultry farm on the clothing and boots of persons coming from infected farms; and vehicles, crates, utensils, or anything used for the conveyance of birds, may also act as a medium for the introduction of disease. Infection can be conveyed from one part of the farm to another in the same way. Another

method by which infection may occur is by the introduction of diseased stock. It might be thought that this could easily be prevented, but such is not the case. Every infectious disease has what is known as a period of incubation, that is to say, a more or less definite time elapses in each disease from the entry of the organism into the body till the appearance of the first symptoms indicating that the animal is diseased, and it may happen that stock are purchased and moved on to a farm in that period. Again, there are many diseases which may develop in either acute or chronic form, and birds affected chronically will often show very little sign of the disease, or there may be no sign at all, especially if the conditions under which they are living are good as regards feed and general hygiene. Later, when adverse conditions occur, the disease may again become active. In one or two diseases the existence of carriers (that is, birds which are affected and infectious to others, but which at no time show signs of disease) is more than probable. Further, it is not usual for the purchaser to know sufficient of the symptoms of various diseases to be able to say whether birds are affected or not, and owing, therefore, to one factor or another, a diseased bird is introduced into the flock.

Both external and internal parasites at times lead to severe disease and mortality among poultry. Poultry ticks, by inoculating birds with an organism, produce a disease known as tick fever. By constantly irritating a bird both day and night, red mite, lice, worms, and other parasites lower its vitality, and disease finds an easy victim. Dust baths, spraying, and certain general measures of good management, go far in preventing infestation by these pests.

Hygiene.

Poultry hygiene is a very important factor for consideration if permanent success is to be looked for by the poultry-keeper. It is of far more value to understand what good hygiene means than to possess any number of isolated and more or less correct ideas as to the treatment of sick stock. The cure of sick birds is not always possible, and rarely profitable, since those that recover seldom regain the vigour which they formerly possessed. Too many people, however, instead of informing themselves concerning sanitary measures, wait until their flocks become diseased, and then try to combat the disease. A surer and less expensive means is to surround the flock with healthful conditions, which will go far towards preventing disease.

In poultry-keeping, many may be successful for a time in defying the laws of sanitation and hygiene; in fact, a very few may be successful for quite a long time; but eventually the majority will find that thorough and intelligent attention to these laws will be one of the best guarantees of permanent success that they can find. Whenever stock are kept under more or less confined and artificial conditions, the question of good hygiene becomes one of first importance.

Housing and Equipment.

A very considerable proportion of disease and mortality can be more or less directly traced to errors in the selection of the site for the poultry farm, and in the construction of buildings in which the

birds are to be housed all or part of their time. The structures should not be placed on low-lying, swampy or badly-drained ground, or on ground likely to be flooded. Birds living under damp and cold conditions are likely to become affected with colds, roup, rheumatism, &c., and they would also have to expend so much of the energy derived from their food in maintaining bodily warmth, that they would not thrive.

The buildings should be located on a rise of the ground where drainage is away from instead of towards its foundations. No moisture should come through the floor, or else it would be difficult to keep the litter dry, as it must always be, if health is to be preserved. The floor should be at least 6 inches higher than the surrounding ground. A properly laid cement or brick floor is safe, sanitary, and permanent. Floors should always be well covered with 4 to 6 inches of dry and clean litter, otherwise they will be cold and uncomfortable. This will also enable the birds to have plenty of exercise, which is very necessary in order to keep them in the best condition. Houses for adult fowls should be open-fronted and face the east; the south, west, and north walls should be wind-proof. If open to the east, the early morning sun will shine right into the house, and help to keep the air pure and sweet. It will also help to keep in check vermin, which thrive in dark, badly-ventilated houses. Houses should face the north only in those localities which are practically free from north winds or are protected by shelter.

Overcrowding must be avoided, and if fowls are to be kept on the intensive system, 4 square feet of floor space should be allowed for each bird. The house should be high enough to allow of good ventilation, and to enable the work to be performed in comfort. It should not be less than 7 ft. 6 in. high in front and 6 ft. at the back, and deep enough (about 15 feet) to allow the birds to roost well away from the front of the house so that they will be out of the weather as much as possible. About 8 inches of perch room should be provided for each bird. Perches should be 15 inches apart, all on one level, and not more than 2 ft. 6 in. from the floor. If a manure pit is provided at the back of the house under the perches, the life of the scratching litter will be prolonged.

Ventilation should be provided for by a 6-inch opening, with a hinged board, the full length of the house at the back close to the roof. This allows a current of air to pass through, and is high enough above the birds to prevent draughts; in addition, it will help to keep the roof cool even in the hottest weather. It will also help to prevent moisture-laden air from accumulating within the laying house.

All fixtures, perches, &c., should be easily movable to enable cleaning and disinfection to be done thoroughly and quickly.

The provision of clean nests is very important, in order to guard against the eggs becoming soiled. Shellgrit has been found to be a good material to place in the nest boxes in order to keep the eggs clean. At the State Research Farm, Werribee, it has been observed also that nests provided with shellgrit are always free of vermin.

Care in Feeding.

It should be a rule never to feed any food which is not clean, sound, and wholesome. Mouldy, sour, or decomposing foods should never be fed. Regularity in feeding and suitable foods make for disease-resisting strength. Foods should be stored in vermin-proof receptacles. Undoubtedly, the best results are obtained by feeding only fresh, succulent green food in the ration. A regular supply of grit and charcoal should always be available for the birds.

The most rapid method by which infectious diseases of all kinds are transmitted through a flock of birds is by means of the drinking water. Therefore, a constant supply of fresh and clean water should always be at hand.

Management of the Birds.

Great care in the selection and mating of the breeding stock is necessary if the resulting progeny are to have a high degree of constitutional vigour and the power to resist disease. Once a bird has ever been sick, it should never be used in the breeding pen.

In view of the fact that bacillary white diarrhoea or pullorum disease is prevalent in Victoria, it would be advisable to have blood tests made of the breeding stock. This disease can be transmitted from the breeding stock to the chickens; deaths may take place from the time chickens are a few days old until they are three or four weeks old.

When stock are purchased, some provision should be made, apart from the runs and pens, in which the birds can be kept, until the purchaser is reasonably satisfied that they are healthy.

Sick and dead birds are a menace to the flock. It has been frequently observed that some poultry-keepers take a sick bird from amongst the flock and allow it to roam anywhere about the farm. This is a bad practice. Sick birds should be isolated immediately, and if they do not respond readily to treatment, should be killed. Every dead bird should be burned (not buried) just as soon as death has occurred. If it is buried, one never knows when, by means of dogs, rats, worms, insects, &c., the disease may be brought to the surface.

Cleaning and Disinfection.

All buildings or structures in which poultry are housed any part of their lives should be subjected to the most thorough cleaning and disinfection every year. All the litter and loose dirt should be removed, the house (floors, walls, and ceiling) given a thorough sweeping and cleaning out, and all parts of the house well sprayed with a good disinfectant. There are many good preparations that will serve the purpose. The chief thing is to use an effective disinfectant, and plenty of it.

How often the general cleaning requires to be done throughout the year depends on the system under which the birds are kept. In some cases the droppings should be removed daily. Under other conditions a regular cleaning once a week would suffice. In any circumstances, a good general clean-up should be carried out every three months.

Food and water vessels and systems should be cleaned and disinfected regularly. On farms where automatic water systems have been installed, the pipes should be cleaned out with a good suction pump or flushed through with the aid of pressure from the water supply. A suction pump similar to that used for pumping water out of gas pipes has been found to be useful for this class of work. It is an advantage to pass a hot soda solution through the pipes, as this helps to remove any decomposing filth.

Before the incubator season commences, incubators, brooders, and brooder houses also should be thoroughly cleaned and disinfected.

A most important operation is the control of red mite. Although not hard to kill, great difficulty is often experienced in getting at their hiding places, so that sheds and perches should be as free from cracks and crevices as possible. The perches can be painted with tar to fill up any cracks, and the jointings treated at intervals with a good disinfectant. During spraying operations special attention should be given to all woodwork, particularly that around the place where the birds roost. For the treatment of lice on the birds, the dust bath should always be kept in order. Individual birds that are badly infested with body vermin may be dusted with a good insect powder.

Tainted ground is responsible for many of the diseases from which birds suffer. When many fowls are run continuously on the same land, the ground often becomes contaminated. Ploughing and sowing a crop will overcome this difficulty, and also ensure a sweet soil.

Bacillary White Diarrhoea or Pullorum Disease.

Bacillary White Diarrhoea or Pullorum disease, is the most serious of all the contagious diseases of poultry. It is said to be responsible for the loss of 10 per cent. of all chicks hatched in the United States of America. It has been present in Victoria for a number of years, and is becoming more common as the poultry industry develops.

Pullorum disease is a specific infectious disease of birds, caused by a micro-organism or germ, the *bacterium pullorum.* This germ was discovered as the cause of the disease by Rettger and Harvey in the United States of America in 1908; it is a slender rod-shaped form. allied to those bacteria known as the paratyphoid group, and can be found in large numbers in the blood and organs of chickens dying from the infection.

In young chickens, the disease occurs as a septicaemia, which runs an acute course, and is usually accompanied by a high mortality rate. It is not confined to chickens, however; adult birds may be infected, although in them the disease generally assumes a chronic and rarely fatal form.

Owing to the fact that white diarrhoea, though frequently present, is not a constant sign of infection in chickens, and that adult birds with the chronic form of the disease do not show any diarrhoea, the name Bacillary White Diarrhoea is being superseded by the term Pullorum disease to describe the condition.

Susceptibility to Infection.

While the domestic fowl is probably the commonest victim to Pullorum disease, it is of interest to note that turkeys, sparrows, and certain cage birds have been proved susceptible to infection. The liability of sparrows to contract the disease assumes some importance in the consideration of the control of infection.

Source of the Infection.

Infection of chickens may occur in several ways, but most frequently through the medium of infected eggs. One of the most interesting and important characteristics of the disease is that when chickens suffer from an acute attack, and, owing to an exceptionally strong constitution, survive, in a large percentage of cases they will retain the infection for long periods, and become "carriers" of the disease. In hen birds, the infection usually persists in the ovarian system, and as a result a number of the eggs laid by carriers are found to contain the germ causing the disease. Many of these infected eggs prove on subsequent incubation to be infertile; in other cases, however, where the infected egg is fertile, the chicken hatching from it emerges infected with the disease. In addition, numbers of the germs which adhere to the down covering the body when it is moist become pulverized and contaminate the air and interior of the incubator as the chicken dries. The immediate result is that the other chickens in the incubator are exposed to infection, which is present not only in the droppings of the infected chicken but also in the atmosphere and on the floor of the cabinet in which they were hatched. Accordingly, shortly after hatching, Pullorum disease makes its appearance. Infected chickens pass large numbers of the germ in their droppings, and as the disease can be contracted by eating food contaminated with the germ, it may readily be seen how liable the disease is to spread rapidly through chickens in the same brooder. Again, contaminated droppings carried from one brooder to another on the boots of poultry-attendants may result in the epidemic spreading from one infected batch right through a hatching establishment. A less frequent means of spread, but one which should be borne in mind, is through the medium of wild birds such as sparrows, which if allowed access to poultry houses may carry the infection from one part to another.

It has been mentioned that eggs from carrier hens frequently prove infertile. *These eggs often contain the germs causing the trouble,* and the practice of feeding infertile eggs from an incubator to poultry has been proved to be the source of outbreaks of Pullorum disease.

As far as is known, the cock bird plays no part as a carrier of the disease.

Acute Pullorum Disease in Chickens.

Symptoms.

The disease may show itself in a very short time after hatching. Deaths usually begin to occur on the third or fourth day, and continue until the third or fourth week after hatching. The rate of mortality averages about 75 per cent., although in small flocks every chicken may be lost.

The actual symptoms shown can hardly be called characteristic. The chickens usually huddle together, with drooping wings, and show little or no appetite. Some of the chickens may show signs of diarrhoea with the passage of whitish pasty material which often adheres to the down around the vent, blocking the opening. In acute cases death occurs very soon after the appearance of sickness. In the more chronic cases, the bird is dull, not interested in its surroundings, may show lameness, and the abdomen is prominent behind. Chicks recovering from the infection remain stunted and show unthriftiness for some time.

Post-mortem Appearances.

In the most acute cases, the bird dies so soon that visible signs of disease are not present. In a large number of cases examined, however, the appearance of the internal organs usually is characteristic. The liver is enlarged, congested, and frequently shows yellowish spots throughout its substance. Pneumonia may be present with grey or yellowish nodules in the lungs, and similar nodules are often found in the heart muscle and in the musculature of the gizzard.

It was thought for some time that an unabsorbed yolk sac was a reliable indication of infection with Pullorum disease, but observations on a large series of chickens at the Veterinary Research Institute have shown that the absorption of the yolk sac may be delayed for long periods in various abnormal conditions of chickens.

Diagnosis.

The proof of infection rests with the recovery from sick or dead chicks of the specific germ causing the infection. The germ can be recovered readily from the blood and organs of an affected bird. The presence of Pullorum disease should be suspected when chickens commence to die in large numbers shortly after hatching, especially if there is no obvious defect of the incubator, or management of the birds. In such cases, no time should be lost in seeking expert advice, as an early definite diagnosis may be the means of avoiding much preventable loss.

Treatment.

All efforts to cure affected chickens are useless, and should not be attempted. Once the disease is established and the diagnosis confirmed, every step should be taken to prevent its spread to healthy chickens. All diseased chickens should be destroyed and the carcasses burnt along with the carcasses of birds dying from the disease. Apparently healthy chickens in contact with diseased birds should be considered potentially infected, and placed in strict isolation. Owing to the fact that the carriers of Pullorum disease are birds which have contracted the disease while chickens, and have survived the infection, recovered chickens and contacts *should never be used for breeding purposes.*

The ideal procedure would be to destroy every individual of a batch of chickens among which Pullorum disease had occurred. As this would entail an economic loss which in many instances could be borne only with great hardship, it is frequently necessary to devise some means whereby surviving chickens may be reared and fattened for table

purposes, and yet prevented from serving as a focus of infection for the breeding stock or newly hatched chickens. The type of scheme to be elaborated depends on the class of farm concerned, and interested poultry-keepers should seek expert advice before adopting such a plan. Incubators, brooders, and runs in which diseased birds have been kept, should be thoroughly disinfected. Probably the best disinfectant for the interior of incubators and small brooders is a 5 per cent. solution of formalin in water. Where practicable, the top layer of soil of contaminated runs should be removed to a depth of several inches, mixed with lime and buried; and the run re-surfaced with clean soil. Failing this, the run should be treated with ground quicklime, and birds kept from it for at least four weeks. All droppings should be collected and burnt.

Pullorum Disease in Adult Birds.

Occasional outbreaks of acute disease of adult birds, due to infection with *B. pullorum* have been described, but they are the exception rather than the rule.

Pullorum disease in the grown fowl is usually of a chronic type, manifesting no symptoms during life. As mentioned previously, when female chicks survive infection, the causal germ usually locates in the ovary, and when the bird becomes fully grown, the infection is found to persist in this part of the body. Although infected birds continue to lay, the number of eggs is diminished, especially towards the end of the laying season. It should be remembered, however, that, judged on external appearances, hens infected with chronic Pullorum disease usually seem quite healthy.

Post-mortem examination reveals the effect of the disease on the ovary. The diseased ova are angular and hard, smaller than normal, and usually show a reddish-yellow or greenish colour. On being cut with a knife, they are found to be quite firm, and of a cheesy consistency. Sometimes infected ova show as cysts containing a dark fluid. Bacteriological examination of these diseased ova shows that they contain the causal germ.

Bearing in mind that the carriers of Pullorum disease appear in sound health, it is obvious that some method whereby infected hens may be detected and so eliminated from the breeding stock would be of immense value.

It has been found that the blood serum of an infected fowl possesses the power of causing the clumping or agglutination of the germs (*B. pullorum*) where a suspension of the germs in saline is mixed with the serum in certain proportions. This test, known as the agglutination test, has been applied to many thousands of blood samples at the Veterinary Research Institute during the past few years, with the result that a number of poultry-farmers have been able to eliminate infected hens from their breeding stock, and consequently to reduce their chicken mortality to a minimum. It is no exaggeration to say that several poultry-men would have been forced to relinquish their business but for the use of this test.

The blood samples for the test are taken by making an incision with a sharp clean knife or scalpel in the wing vein at the point where it passes over the elbow joint. A small incision made in the direction of the length of the vein, rather than across it, is preferable. The blood is allowed to flow into small, clean, dry tubes, which may be obtained from the Institute. Immediately the samples are taken, they should be corked, and forwarded at once to the laboratory by the most direct route. If practicable, it is advisable, when undertaking the collection of blood samples for the first time, to seek the assistance and advice of the Poultry Department.

Control of Pullorum Disease.

The control of Pullorum disease, as with every contagious disease, can be assured only by the definite co-operation between those engaged in the industry and the Government Department which administers the Stock Diseases Act.

An important step, and one which would have a marked effect, would be the certification of flocks proved free from Pullorum disease. Poultry-breeders should be given the opportunity of having their breeding stock tested under departmental auspices, and those flocks proved free from the disease should be "accredited" by the Department. Of course, certain fundamental principles would need to be observed with regard to the introduction of fresh stock to an accredited flock. The conditions governing the establishment and maintenance of an accredited flock would be determined by the Department.

In this way, purchasers of eggs for hatching, or of day-old chickens, by dealing with accredited farms, would be safeguarded, as the possession of a Government certificate by a poultry-farmer would imply a freedom of his stock from Pullorum disease.

Summary.

1. Pullorum disease is a contagious disease of poultry, caused by a micro-organism or germ, the *Bacterium pullorum*.

2. The disease is usually accompanied by a high mortality. Recovered female chickens frequently retain the infection in their ovaries, and become "carriers."

3. The acute form among young chickens generally starts in the incubator through the hatching of infected eggs laid by a carrier hen.

4. Deaths occurring among newly-hatched chickens, with an increase in the rate of mortality from the fourth to the tenth day, should arouse the suspicion of the owner. In such cases, a definite diagnosis should be sought. For this purpose, preferably live chickens should be submitted to a laboratory for examination.

5. When a diagnosis of Pullorum disease has been confirmed, all sick chickens should be destroyed, and all carcasses burnt.

6. Chickens in contact with diseased birds should be isolated immediately, and if reared, they should never be used for breeding.

7. Chicken houses, incubators, brooders, &c., in which the disease has occurred should be thoroughly and efficiently disinfected before being used again.

8. In flocks where the disease has occurred, the breeding stock should be tested, and the reactors to the test eliminated before the next breeding season. Eggs from non-reacting hens only should be used for hatching. All reactors should be isolated, and used for table purposes.

9. The disease is very contagious. The germs causing the disease are present in large numbers on the bodies of diseased chickens, in the droppings, and in the litter of incubators, brooder-houses, &c. Extreme care should therefore be taken to thoroughly wash and disinfect the hands, boots, overalls, &c., after handling infected material.

At the Veterinary Research Institute, it has been found possible to examine a limited number of blood samples each year for the presence of Pullorum disease. It is hoped that this service will be available during the current year, but poultry-keepers are reminded that, under the existing conditions at the Institute, the number of tests which can be dealt with is strictly limited.

A charge of £1 10s. for each 100 tests is made. The collecting tubes will be supplied by the laboratory on application. Poultry-keepers who desire to have birds tested should communicate with the Director, Veterinary Research Institute, Story-street, Parkville.

Coccidiosis.

Coccidiosis is primarily a disease of the intestinal tract, although in chickens the liver may occasionally be affected, and geese sometimes show signs of the disease in the kidneys. The disease has also been found in ducks, turkeys, and pigeons. From a practical point of view, however, Coccidiosis is most important when it occurs among chickens.

The majority of the minute microscopic organisms associated with the causation of infectious disease belong to two main classes, namely, the *bacteria* and the *protozoa*. The bacteria represent the lowliest forms of plant life; the protozoa, on the other hand, are generally regarded as the lowest forms of animal life. Microscopic in size, they have bodies consisting of a single cell, and they frequently exhibit a complicated life cycle, or process of reproduction. To the group of protozoa belong the Coccidia, which cause the disease known as Coccidiosis.

Susceptibility.

All birds, whether wild or domesticated, may contract Coccidiosis if exposed to infection. As with many other diseases, the ravages of Coccidiosis become more serious when it appears among birds kept in confinement. Geese, turkeys, and ducks on free range are rarely affected in large numbers, although an occasional isolated case may occur from time to time. When Coccidiosis makes its appearance among birds kept in close confinement, the result is generally very serious, and the disease frequently assumes enzootic proportions.

Age Incidence.

Coccidiosis is most serious when it occurs among young birds. Growing chickens are particularly susceptible to infection, but as maturity is approached, a considerable degree of natural resistance is manifested.

It is only when adult birds become grossly infected, or their resistance weakened through some other cause, that they suffer from *Coccidiosis. In fact, mature fowls may frequently be found harbour*ing coccidia in their alimentary canal without showing any ill effects. Such birds, however, may provide the infective material for a serious outbreak among chickens kept on the same property.

The Parasite and its Life History.

When viewed under the miscroscope, the coccidia, in the state of development occurring in the droppings of infected birds, are found *to be minute bodies, with an ovoid or round shape, and possessing a* thick double shell. These egg-like structures are known as *Oöcysts,* which contain within their shell four small structures known as *sporozoites.* The *Oöcysts* possess a marked degree of resistance to adverse conditions.

Coccidiosis is spread by healthy birds taking in these *Oöcysts* with their food and water; that is, infected droppings with which fowl-runs have been contaminated are the means by which the disease is spread from bird to bird.

When the *Oöcysts* reach the intestinal tract, the *sporozoites* which they contain are liberated; the liberated *sporozoites* then penetrate and destroy the cells lining the mucous membrane of the gut. Each *sporozoite* entering a cell begins to multiply rapidly, and the progeny invade further cells so that, in an intense infestation, the destruction of the lining of the bowel becomes extensive. After a certain time, *the quick division ceases, and the young coccidia become differentiated* into male and female forms; the females are fertilized by the males, and the result of this sexual conjugation is the production of *Oöcysts.* The *Oöcysts* are cast off from the intestinal lining, are voided with the droppings, and the life history proceeds again in the birds swallowing the *Oöcysts.*

Symptoms.

Chickens infected with Coccidiosis may present signs of infection from the tenth day onwards, although, as a general rule, the disease appears after the fourth week. The course is more rapid in very young chickens, with usually a high mortality. The main symptom shown is diarrhoea, with the passage of whitish fluid droppings, which may be streaked with blood. Infected birds become weakened and dejected, with drooping wings and ruffled feathers; the appetite is generally seriously impaired, or may be absent. Death takes place in a day or two after the appearance of symptoms, although older chickens may live for several days to a week or more before death ensues.

In grown fowls, the disease is usually more chronic, with the development of a progressive emaciation and anaemia. The appetite may remain normal, but in the intervals between regular feeding, they show no inclination to scratch for food. Affected birds may live for *three weeks after the first signs of the disease are noted.* Death frequently occurs quite suddenly.

Post-mortem Findings.

The chief abnormality present consists of a distension of the blind gut or caeca with blood-streaked semi-solid material. Frequently, apart from an anaemic condition of the body, and a moderate distension of the caeca, no typical naked-eye characteristics can be found. It is necessary to stress the fact that it is generally impossible to make an accurate diagnosis without a microscopic examination of the contents or the lining membrane of the bowel. When very young chickens are attacked, it is necessary to make a differentiation between Coccidiosis and Pullorum disease; this is possible only by laboratory investigations.

Methods of Transmission.

The chief methods of extension of the disease may be tabulated as follows:—

1. From apparently healthy but mildly infected birds. The presence of birds harbouring coccidia in their bowel always constitutes a menace to growing chickens. The infective *Oöcysts* present in the droppings may be carried on the boots and clothes of the attendant from the adult birds to the brooder houses and chicken runs.

2. Sparrows and other wild birds may carry the disease from place to place, either mechanically or through their own infected droppings.

3. Chickens may be reared in infected coops, or on ground previously contaminated by infected birds, or they may be transported in crates soiled with infected material.

4. It is sometimes difficult to explain an outbreak of Coccidiosis in very young chickens which have been hatched and reared in new equipment. Such outbreaks may be due to using eggs for hatching which have been laid by infected hens and soiled with droppings containing the *Oöcysts* of coccidia. When the chicken emerges, it picks up the infective material by pecking at the egg shell, becomes infected with Coccidiosis, and transmits the infection to the other chickens. The appearance of Coccidiosis as early as the tenth day after hatching may be explained in this way.

Control.

Up to the present time, no effective medicinal treatment for Coccidiosis has been elaborated. The use of crude Catechu in the proportion of one-third of a teaspoonful to each gallon of drinking water has been recommended for a long time, mainly with the object of preventing the disease gaining a hold, but it is extremely doubtful if this drug has any value. A mash containing 40 per cent. of dried skim milk has been used as a preventive agent, apparently with some degree of success. From every practical point of view, however, prevention of the spread of the disease is the only sound method of control. Once the diagnosis of Coccidiosis is established, all sick birds should be destroyed and their carcasses, together with those of birds dying from the disease, burnt.

Birds not showing symptoms, but in contact with diseased birds, should be immediately and satisfactorily isolated, and every care taken to prevent the distribution of infected droppings to other parts of the farm. The ideal procedure would be for one person to undertake the feeding and general management of the isolated stock, and to have nothing to do with the remainder of the poultry farm. Where this is impracticable, the isolated stock should be attended to last, and whoever undertakes this work should at its conclusion make sure that his hands, boots, &c., are carefully disinfected. All droppings should be removed well away from the precincts of the farm, where they should be burnt. The cleansing and disinfection of the houses should be thorough. In cases where the floors of the pens, houses, &c., are concrete, brick, or other non-inflammable material, the most efficient disinfection can be accomplished with a painter's blow-lamp. Failing this, the use of some well-known chemical disinfectant in the strength advised by the makers is recommended. Runs to which diseased birds have access are highly dangerous, and should be abandoned for at least a year. Where this is impossible, the soil should be treated with ground quicklime, and ploughed or dug under.

Poultry farmers should always seek the co-operation of the poultry experts of the Department of Agriculture in attempting any system of disease control.

Chicken Pox.

Chicken pox is one of the greatest causes of loss and trouble to the poultryman in Victoria. A great number of outbreaks have come under the notice of the Department.

The disease has the general symptoms of roup, but is distinguished from it by the eruption of pox nodules on the head and by the presence in the mouth, throat, and eyes of tough, cheesy patches, which are firmly attached to the tissues beneath them. The eruptions appear in round and irregular-shaped nodules varying in size from a pin's head to a pea, principally on the beak and on the nostrils, also on the comb, wattles and ear-lobes. Owing to the number of nodules and the extension of inflammation, large patches of skin become thickened and covered with hard, dry crusts, closing the nasal openings and eyelids, and making it difficult for the bird to open its beak, or to see. Very often the inflammation extends from the nostrils, and penetrates to the air tubes and lungs.

Some fowls in a flock are resistant, and if attacked by the disease, will, after a few days' illness, rapidly recover; others remain weak and thin in flesh, and may have more or less catarrh.

As the disease is highly contagious, the houses, feed troughs, and drinking vessels should be kept disinfected during an outbreak, and for at least a fortnight after.

In America, chicken pox vaccine is used for the prevention of the disease, but reports vary as to its effectiveness. In some cases it appears to prevent or lessen the severity of the outbreaks, while in others no benefit seems to be derived from its use.

Experience gained at the State Research Farm, Werribee, indicates that outbreaks of chicken pox can be greatly lessened, if not prevented, by taking a few simple precautions.

Flocks at the Research Farm are given regular doses of Epsom salts and sulphur in their mash from January to April. The houses are frequently cleaned and sprayed with a good disinfectant. Roosts and nest-boxes are regularly examined for mites, as it is quite possible that these insects spread infection by inoculation from sick to healthy birds. At Werribee, roosts, &c., are painted with sheep-dip; tar oil is used at Burnley; both are effective remedies. Houses are sprayed with chloride of lime—4 to 6 oz. to the gallon of water. When giving Epsom salts it is best to dissolve the salts in the liquor in which the mash is to be mixed, thereby getting an even distribution. When using sulphur, it should be thoroughly mixed with the bran before wetting. The amount used at the Research Farm is 1 lb. of Epsom salts to every 300 birds. The custom is to give this dose on Monday morning; 1½ lb. of sulphur to every 300 birds is given on Thursday morning.

If chicken pox appears amongst a flock, all birds showing signs of the disease should be isolated. Salts and sulphur should be given in the manner suggested above, but at the rate of 1 lb. of each to every 200 birds. The sores should be washed in water made claret colour with permanganate of potash, and, when they are thoroughly dry, painted with iodine.

If poultrymen will adopt this treatment, combined with strict cleanliness, and feed to their birds liberal quantities of green stuff during the early months of the year, they will be saved a great amount of worry and inconvenience, and a considerable loss of eggs will be avoided.

Wattle Disease.

A common poultry trouble in certain parts of Victoria, particularly in the warm northern districts, is what is known as Wattle Disease. Briefly, the signs and symptoms of the disease are—Following some injury to the wattle—the smallest is sufficient in infected yards—the wattle becomes inflamed and swells. During the next few days the swelling increases, and on examination a hard mass can often be felt. In other cases the whole of the wattle is hard, swollen, and congested. If no treatment be adopted, the skin may break down and the wattle discharge. This goes on for a considerable period with little diminution in the size of the wattle. Later, in bad cases, the whole of the wattle interior may shell out as a dead

mass, and the organ will shrivel up. However, it has been found that the germ still lives in the wattle, and therefore such birds are dangerous as carriers of the disease. In other types the swelling may extend up under the throat, often resulting in death, due to interference with the air passages. In such cases the eye is always involved.

The White Leghorn—pullets and cockerels—is the breed usually attacked, whereas Australorps are relatively free. The more pendulous wattles of the White Leghorns render them more liable to infection from dirt. The disease has been shown to be due to the same germ that causes the dreaded fowl cholera. When the germ gets in through the skin, however, it appears to have lost much of its ability to cause the cholera of the type that kills so rapidly, and seems to show local effects only. In only rare cases does the infected bird show

Early Onset of the Disease—Wattle Swollen and Congested.

blood poisoning. Yet the germ exhibits many of the characteristics of fowl cholera, for experiments have proved that it is capable of causing the death of a rabbit 24 hours after injection under the skin.

Control.

Should this disease be seen for the first time in the yard, the best plan is to destroy and burn all affected birds. Any brought in from outside should be kept in quarantine for a few days in order that the wattle may be examined.

In a yard where the disease is common, it must be recognized that the ground is infected, and the source is the discharge from infected wattles. Disinfection is best done by burning all litter. The buildings,

&c., should be sprayed with chloride of lime, and, if possible, the yards should be top-dressed with lime, ploughed and sown down to greenstuff. For enclosed birds concrete floors in the pen are of great benefit in the control of this disease.

White Leghorn with one Wattle removed as a result of Wattle Disease, and now showing the chronic form in the remaining Wattle.

(Note the distortion and thickening. Such chronic cases are carriers.)

The only practicable treatment that can be adopted with infected birds is the removal of the wattle. This is simply done with a sharp knife or a pair of scissors. The wound heals in a very short time. Occasionally there is profuse bleeding when a blood-vessel near the base of the wattle is cut, but there is rarely any danger from this. All instruments should be sterilized in a lysol solution, and the wattles should be burnt.

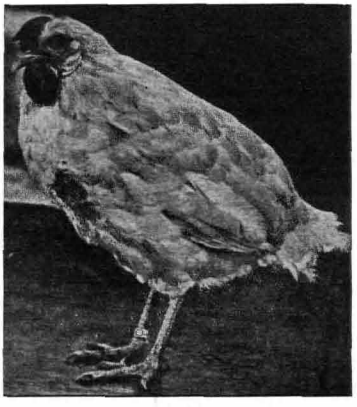
Newcastle Disease.

Newcastle disease, which made its first appearance in Victoria in 1930, is caused by an organism so minute that it cannot be seen even under a high power microscope. The first symptom noted is that the bird becomes sleepy and stands by itself. The tail droops, and every now and again the bird will shiver or make a convulsive movement. If grain is offered, the bird will pick at it in an unconcerned way. The respirations are increased, and there is a watery, yellowish-white, foul smelling diarrhoea. As a rule, the crop is distended with a sour smelling, *greyish-brown fluid.*

In the majority of natural cases there is a thick mucous discharge from the nostrils, and in the mouth a varying amount of frothy exudate which occasionally hangs in threads from the end of the beak. The comb and wattles become dark in colour. The most characteristic

symptom noticed is in connexion with the respiration. There is a long, gasping inhalation through a half-opened beak. Death usually occurs between the third and sixth day after symptoms develop. Occasional *birds may die without showing any symptoms. A few may live much* longer, and some may even recover. These birds, however, become partially paralysed as the disease progresses, and those which continue to live remain paralysed in one or both legs, or have their necks distorted, and are quite useless for practical purposes.

As with most diseases of this nature, the post-mortem lesions are not constant. As a rule, however, the skin and muscles will be found to be slightly darker than normal. In the fat around the gizzard, a number



Early Stage of the Disease.

of dark-red blotches or spots, due to haemorrhage, are noticed. The small bowel immediately behind the gizzard shows haemorrhagic blotches. The lining of the sac immediately in front of the gizzard—the proventriculus—is found to be haemorrhagic. The sac around the heart sometimes has an excess of fluid. The contents of the bowels frequently consist of liquid only, and are grey in colour.

The droppings, the discharge from the mouth and nose, the blood, and every portion of the body of the bird are infectious; and, therefore, the disease may be spread by feeding birds on hotel offal which may contain uncooked portions of affected birds or bread scraps, leaves, or peelings of vegetables which have been soiled by the hands of persons who have stuffed and trussed birds for cooking, or shells of eggs which have been soiled on an infected farm. It may also be spread by fowls which come in contact with infected birds in markets, or which are

placed in crates or coops which have been occupied by infected birds, or soiled by their droppings. It may also be carried from one pen to another or *from one farm to another by persons whose boots have* become soiled with the droppings of infected birds.

PRECAUTIONS RECOMMENDED.

Owners of poultry should take the following precautions:—

1. If any birds show symptoms resembling those mentioned, notify the Chief Veterinary Inspector immediately, when an officer will visit and advise as to the procedure to be adopted.

2. Do not visit infected farms out of curiosity. If such a visit is unavoidable, clean and disinfect boots and any portion of clothing which may have become soiled, by washing with a 5 per cent. solution of lysol before entering your own or another poultry farm.

3. Do not feed raw refuse from shops or hotels or restaurants to birds. Always cook the material before feeding.

4. Do not feed egg shells from any source to poultry.

5. Arrange poultry pens in such a manner that it is not necessary to enter them for the collection of eggs or the supply of food.

6. Have separate drinking utensiles for each pen. Avoid a continuous trough, which may carry the disease from pen to pen.

7. An impervious partition about 2 or 3 feet high between pens will help to check the spread of the disease from pen to pen.

Catarrh.

Catarrh is an inflammation of the nasal passages, and is a very common ailment amongst poultry. It is noticed that late-hatched chickens and weak and poorly nourished birds are more subject to attack than early-hatched, strong, vigorous birds. Badly-ventilated houses and exposure to the weather are usually the cause of an outbreak.

If prompt measures are not taken it will often develop into roup.

Generally the first signs are diminishing appetite, growing difficulty in breathing, and a watery discharge from the nostrils.

Birds should be put into a well-ventilated house free from draught, given a good tonic, such as Merval, and fed on nourishing food; minced raw onions will be found a great help. In severe cases the nostrils should be well washed with water made wine colour with permanganate of potash. A good plan is to immerse the bird's head in it three or four times, holding the head under for a few seconds at a time. This thoroughly disinfects all the passages of the mouth and nostrils.

Bronchitis.

This complaint sometimes follows catarrh, being an extension of inflammation to the mucous membrane of the bronchial tubes. The distinguishing characteristic is rapid breathing, with a slight rattling noise.

Roup.

In Victoria roup is a quarantinable disease. The symptoms in the early stages are somewhat similar to those of catarrh, accompanied by fever and general lassitude. In a few days there is a swelling of the face, with cheesy matter round the eyes, and a very offensive breath, which is a feature of this complaint. The course of the disease—unless the issue is almost immediately fatal—is usually somewhat prolonged. Immediate isolation is necessary in the case of affected birds, and it is generally better to destroy them and burn the carcass than to attempt to effect a cure. Where, however, this is attempted, it is desirable to place the bird in clean quarters free from draught, feed it on soft food, and administer a tonic.

Aspergillosis (Mycosis of the Air Passages).

The first symptoms usually are loss of appetite, followed by abnormal thirst. Next comes rise in temperature and heavy breathing, accompanied by a rattling sound, due to the vibration of the mucus in the trachea. Diarrhœa follows with subsequent emaciation, and death generally occurs in from one to six weeks. This disease is frequently mistaken for tuberculosis. *It is, however, caused by aspergillus mould* growing in the mucous membrane of the air passage. These moulds are inhaled or swallowed with the food from dead organic matter, such as straw, &c. To avoid risk of infection, well-ventilated houses should be used, mouldy litter should be avoided, and care taken that no mouldy grain is fed to the birds.

Tuberculosis.

This complaint is fortunately not so prevalent as might be expected, and is rarely found in young stock. The principal external symptoms are increasing emaciation, general debility, and diarrhœa. Any attempt *at cure is hopeless.*

Pneumonia.

The symptoms are abnormal thirst, lack of appetite, and constipation, with rapid and laboured breathing. The progress is very rapid, on account of the extreme feverishness. This disease is cured only rarely, and the attention involved in nursing affected birds is considerable.

Fowl Cholera.

Fowl cholera, according to Dr. Pearl, is a virulent, usually fatal, and highly infectious disease. It is entirely distinct from the ordinary forms *of enteritis.*

The earliest indication of this ailment is a yellow coloration of the urates, or that part of the excrement which is excreted by the kidneys. This is normally pure white, though at times tinted with yellow as a result of disorders other than cholera. Generally the diarrhœa is a prominent symptom. Soon after the first symptoms appear the bird separates itself from the flock, the feathers become ruffled, the wings droop, and the head is drawn down towards the body. Weakness develops, and heavy drowsiness sets in. The crop is nearly always distended with food, and apparently paralyzed. Usually there is intense

thirst. Death generally occurs within a few hours to several days. The majority of the flock may be lost in a few days, or a few at a time for several weeks. Infection is generally due to the food or drinking water becoming contaminated with the excrement of sick birds; the eating of the bodies of dead infected birds may also cause infection, or it may result from inhalation of the germs or dust suspended in the air.

Treatment.—There is really no certain cure, and dead birds should be thoroughly destroyed by fire. All the litter and droppings should be scraped up and burnt, and the houses, &c., thoroughly sprayed with strong disinfectant.

Crop-Bound—Impaction of the Crop.

This is generally due to some obstruction of the passage from the crop to the stomach. Feathers, fibrous matter, or straw may be responsible. The first treatment is to administer salad oil, and the mass that has formed in the crop should be kneaded up. Failing this, a cut should be made about an inch long, and the contents of the crop removed. The crop may then be rinsed out with a weak solution of permanganate of potash. In sewing up, the inner skin of the crop should be sewn up separately before any attempt is made to sew up the outer skin. This is an extremely simple little operation.

Egg-Bound.

Where a bird has any difficulty in passing an egg, castor oil should be administered at once. Should this prove ineffective, a few drops of tincture of iodine should be added to boiling water in a jug, and over this the vent should be steamed. If by any chance the egg should become broken in the oviduct, the utmost care must be exercised to remove all of the shell, as otherwise broken pieces may cause considerable damage to the wall of the oviduct.

Vent Gleet (Cloacitis).

This offensive complaint is generally transmitted through the male bird. Salmon remarks that the first symptom observed is the frequent passage of excrement voided in small quantities almost as rapidly as it reaches the cloaca, which becomes tender and irritable, giving the bird the sensation of fullness, and producing spasmodic contractions. In the early stages the mucous membrane is red, dry, swollen, and hot, and this is followed in a day or two by a discharge which is at first thin and watery, but soon becomes white, purulent, and offensive. This discharge collects upon the skin and feathers about the vent, obstructs the passage, and irritates the parts with which it comes in contact. The soiled skin becomes red and inflamed, and ulcers may be started. Owing to the nature of this trouble, it is generally preferable to destroy affected birds at once.

Bumble-foot.

This is due to an abscess in the ball of the foot, which may have been caused by too high perches, very narrow perches, or wounds caused by sharp substances, such as a nail, broken edge of glass or crockery, &c.

The treatment consists in opening up the foot and squeezing out the core. The wound should then be bathed with mild antiseptic, and the region of the wound painted with tincture of iodine. A piece of clean rag should be tied over the wound for a few days to keep the dirt out.

Apoplexy (Hæmorrhage of the Brain).

Generally the affected bird drops dead or paralyzed without any previous signs of illness, and a *post-mortem* examination shows clotted blood on the brain. The death is caused by the rupture of a blood-vessel and the consequent pressure on the brain, due to the blood which escapes. The cause of the rupture may be an unhealthy condition of the walls of the brain blood vessels. Preventive treatment should consist of increased supply of green food, with less stimulating foods.

Heat Prostration.

In Victoria great loss in poultry has been experienced from heat prostration. It is caused principally by housing birds in corrugated iron-roofed houses without sufficient ventilation, and also by not providing sufficient shade in runs or yards. Another cause is the over-crowding of birds in crates. It is very common in birds sent to the egg-laying competition in badly constructed coops.

Good layers, which are always heavy feeders, are usually the first to become affected.

Prevention.—All poultry-houses should have a ventilator space of 4 to 6 inches, provided close to and the full length of the roof. This allows a current of air to be always passing through close to the roof, keeping it cool on the hottest day.

Shade should be provided in the yards either by growing trees or by frames covered by hessian. Keeping the dust baths well sprinkled with water is also a great help to the birds.

Treatment.—As soon as possible the heads of affected birds should be held under cool running water for a few moments, and a little water should be sprinkled under the wings. They should then be placed in a shady place where a current of air can play round them. They must be kept perfectly quiet, and when revived placed in a pen away from the flock and fed on easily digested nourishing food for a few days.

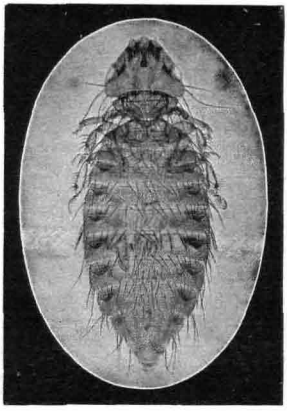
POULTRY PARASITES.

External and Internal Parasites.

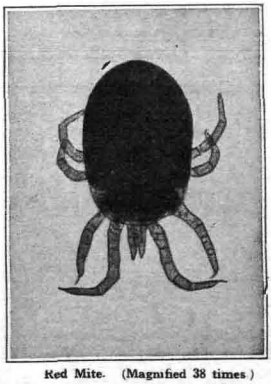
Domestic poultry is frequently infested with parasites belonging to different species, such as lice, mites, ticks and worms, which by their increasing numbers and by the effects of irritation cause considerable discomfort to their unfortunate hosts. Chickens so affected mature slowly and become liable to many ailments.

Laying hens grow thin, their egg production is reduced considerably, and the flesh of table birds becomes poor in quality. There is also every possibility of the parasites carrying and distributing disease-producing organisms. Examination of the birds themselves and also of the sheds for vermin is too often neglected, and the cause of the unhealthy condition of fowls often is not ascertained until after considerable loss has occurred. Prevention is always better than cure, and constant attention and cleanliness are the only means of keeping vermin

in check. Houses should be regularly sprayed with kerosene emulsion, carbolic solution, chloride of lime, or any other good disinfectant, and nests, perches, &c., frequently examined and treated.



Common Louse of the Fowl. Magnified 37 times.



Red Mite. (Magnified 38 times.)

Some general details are given below regarding those specimens more generally met with in domestic poultry. They are separated into divisions as follows:—

KINGDOM— Animalia

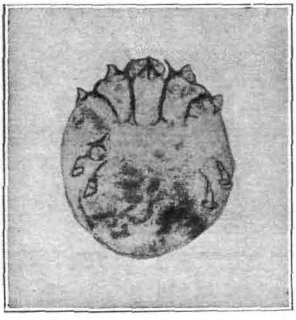
BRANCH— Arthropoda. | Vermes.

CLASS— *Insects.* | *Mites and Ticks* | *Worms.*

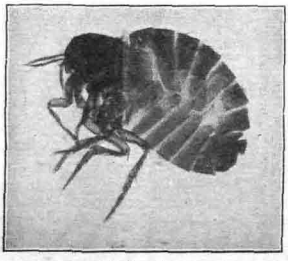
Insects.
- Lice.
- Fleas.

Mites and Ticks
- Red Mite.
- Scaly Leg Mite.
- *Depluming* Scabies.
- Poultry Tick.

Worms.
- Round Worms
- Gape Worms.



Scaly-leg Mite. (Magnified 100 times.)

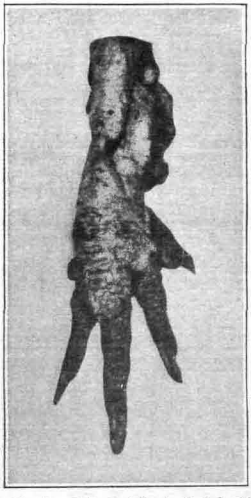


Sticktast Flea.

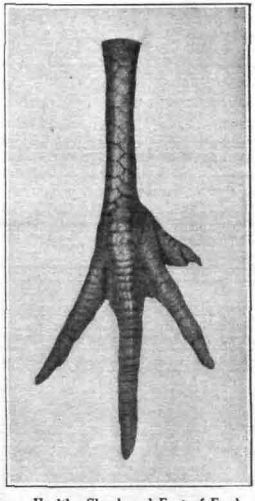
Lice (Mallophaga).

Unlike the red mite and tick, lice live permanently on their hosts Occasionally they may be seen on the roosts and in the nest boxes, but if they do not return to the bird they will die in a couple of days for want of nourishment and warmth. They have mouth-parts adapted for biting and chewing the surface of the skin or feathers and do not suck blood like the mites and ticks. Sometimes they may be found to contain blood, but this is a mere chance, the blood having been obtained from a young feather or by biting a tender part of the skin.

Lice do not go through a complete change of form like a butterfly or moth. Eggs are laid on the feathers of any poultry, and in from seven to ten days the young emerge. They are similar in appearance



Shank and Foot of Fowl affected with Scaly-leg Mite.



Healthy Shank and Foot of Fowl.

to the adult, but very small. The period required for full development from the time the egg is laid is from sixteen to twenty days. Breathing takes place through spiracles or small holes in the body of the insect and not through the mouth. Under the microscope respiratory or breathing tubes can be seen connected to these holes all through the body

There are about twenty different species of lice found on domesticated poultry, and with the exception of the head louse, all can be treated

in the same way. But it should always be remembered that prevention is better than cure. A dust-bath must be provided for the birds. A portion of the shed or yard should be boarded up for about a foot and supplied with fine dust. Wood ashes and sand will keep the dust-bath loose; the addition of flowers of sulphur is often recommended. Individual birds that are badly infested may be dusted with a good insect powder. The head-louse of chickens and fowls causes a great deal of trouble at times. Te best treatment for this is to give any affected bird a dressing of vaseline, or any other heavy non-irritating oil.

Fleas.

Amongst these pests, the " Stickfast " flea is the most troublesome; fortunately it has not yet been recorded in Victoria, though in Western Australia it has proved a source of worry to the poultry keeper. In addition to poultry, it attacks wild birds, cats, dogs, and horses. Its effect on chickens is very severe, and mortality as high as 85 per cent. has been reported in some countries. The importation of poultry to Victoria *from Western Australia is restricted on account of this pest.*

" Stickfast " fleas are blood-sucking insects, and they attach themselves in considerable numbers to the comb, wattles, and lobes, and around the eyes, hence the name " Stickfast." During its life this insect undergoes a complete change of form. The adult fleas sometimes lay their eggs on the ground, or they may lay them whilst on the bird, but the eggs are not glued to the feathers in the same way as the eggs of the louse. Small grubs hatch from the eggs and feed on the organic matter in the soil, and when they grow to maturity burrow from 3 to 6 inches into the ground to spin their cocoons. Finally, from this chrysalis stage the full-grown insect emerges. The period necessary for its full development varies, according to weather conditions, from four to six weeks. Some of these insects will live as long as twelve months.

To eradicate these fleas it would be necessary to clean out the houses and yards well and spray the ground so as to destroy the grubs and eggs. The best remedy is to apply non-irritants such as castor oil *or vaseline direct to the fleas on the birds; care being taken to* see that the insects are well covered with the preparation so as to stop up their breathing spiracles. Buyers should be careful when buying poultry that they do not purchase from infected yards, and as a further precaution all birds should be carefully examined before being liberated.

Red Mite.

This is a very common poultry pest. When full grown, it is about *one-sixteenth of an inch long; it can be very easily distinguished from* the louse. The head, thorax, and abdomen are fused into one piece. In the adult stage the red mite has four pairs of legs. The mouth-parts are adapted for piercing and sucking, and the insect's only food is the blood of the bird. These mites attack the birds at night and remain during the day-time in cracks and crevices of the perches, nests, and houses. They cause the birds considerable irritation and consequent loss of sleep. The red mites lay their eggs in their hiding places, and

these hatch out in from five to seven days. Although not hard to kill, great difficulty is often experienced in getting at the mites' hiding places, consequently sheds and perches should be as free from cracks as possible. Spraying should be well done with a good penetrating fine mist spray; chloride of lime, from 6 to 8 oz. to the gallon, or any other good disinfectant, is suitable for the purpose. There is nothing better than sheep dip or tar-oil for painting the roosts, and at intervals the joinings of the uprights and perches should be painted with some strong disinfectant.

Scaly-leg Mite.

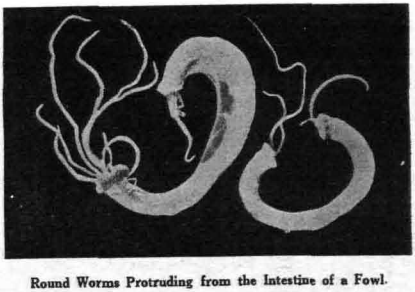
These are very small mites, each measuring about 1-100th of an inch long. They live and will multiply rapidly under the scales of the legs and feet of birds. They burrow under the scales and cast out the debris; rough crusts are formed and gradually the feet present a deformed appearance which, if neglected, will ultimately cause lameness. The mites are readily transferred from one bird to another, and prompt treatment is imperative. The crusts may be softened by soaking in warm soapy water, and the dirt removed by scrubbing with a nail brush, care being taken that bleeding does not occur. An ointment consisting of sulphur and fat, kerosene and fat, or carbolized vaseline should then be applied, and the treatment repeated in a week's time. This should effect a gradual cure.

Depluming Scabies.

Sometimes the feathers will fall off the breast and other parts of domestic birds. This is very often caused by a mite smaller than the scaly-leg mite, measuring about 1-150th of an inch long. Affected birds should be isolated and given a dressing of sulphur ointment around the affected parts and also a little distance inwards from the bare part, where the feathers are.

Round Worms.

Round worms are hard to eradicate, and prevention should be aimed at. More than ordinary care must be taken to clean up the excreta of the birds. The eggs are laid in the gizzard and intestines,



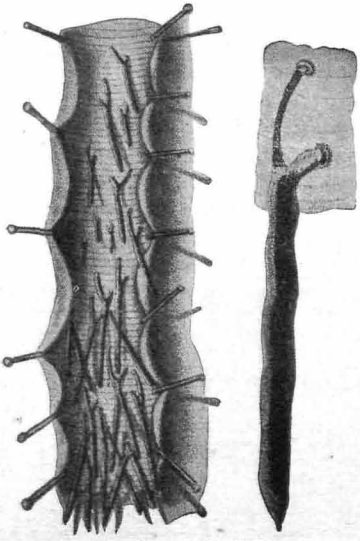
Round Worms Protruding from the Intestine of a Fowl.

and some of them pass out of the bird to the ground. Other birds pick up the eggs and become infested. The ground should be sprayed with a solution of chloride of lime, from 4 to 6 ozs. to the gallon of water. Feed onions in the mash to the amount of three-quarters of an ounce to the adult fowl three times a week; give the chickens as much raw onion with the green food as they will eat. Give Epsom salts to the adult birds at the rate of a 1-oz. packet to twelve birds, and to chickens at the rate of about 1 oz. to twenty birds, varying the quantity according to their age; carry this out on two occasions at an interval of three days.

In the case of heavy infestation by round worms it is advisable to obtain further instructions from the Chief Poultry Expert. Indeed this applies to all cases of worm infestation.

Gape Worms.

The gape worm, or as it is sometimes called, a Y or forked worm, is from about one-half to one inch in length. It attaches itself to the mucous membrane of the wind-pipe of the bird and sucks blood.

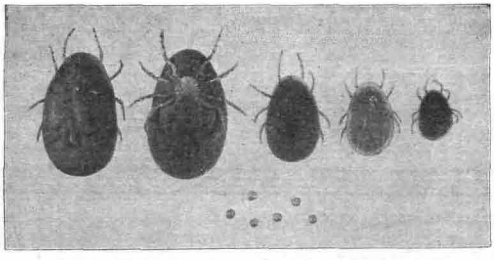


Gape Worms. (Magnified.)
Wind-pipe pinned open, showing worms attached.

The bird is noticed to open its mouth frequently and gasp for air. But, once again, it must be emphasized that prevention is better than cure. Treatment similar to that for *round worms* will help to remove the cause.

Tick.

Poultry tick is a serious and troublesome pest in some of the warmer parts of the State. In colder districts it does not thrive so well. A knowledge of its life history and habits is essential for those poultry farmers whose birds have become infested, in order that steps may be taken to stamp it out. Such knowledge is equally necessary for those whose birds are free of the pest, in order that this immunity may continue.



Ticks at various stages of growth, and Eggs.
Magnified approximately three times.

Ticks, in various stages of growth, together with their eggs, may be found concealed in the cracks and crevices of houses and perches. The eggs are of a brownish colour, and are about one-fortieth of an inch or slightly less in diameter. The newly-hatched ticks measure about one-thirty-second of an inch long; the older ones vary in length up to about one-third of an inch. They are oval in shape, flattened, with thin edges, and are covered on the upper surface with small pits of differing sizes. Their colour varies from brownish to grey-black. They are without eyes. Breathing takes place through breathing apertures distributed throughout the body.

The eggs hatch out in from three to four weeks from the time they are laid. The newly hatched ticks crawl on to the birds, and remain attached to the skin for a few days. They may be seen in small clusters, seemingly blue-black in colour, with their mouth parts inserted into the skin on various parts of the body. The young ticks will usually remain on a bird's body for five days or so. During this time they

will get enough nourishment to sustain them for a period, and they then seek hiding places in the perches and walls.

Young Tick (shortly after hatching) with three pairs of legs.
Magnified approximately 16 times.

The adult ticks have four pairs of legs, but those newly hatched have only three pairs. A moult takes place in about a week after hatching, when the fourth pair of legs appears behind the third pair. From the time of hatching three moults take place. The ticks reach the adult

A Dead Fowl on which the Young Tick may be seen in small clusters on various parts of the body.

stage in about 30 days. The mature tick visits the birds at night, and in from 20 to 45 minutes it becomes fully engorged with blood, and returns to the cracks and crevices of the houses and perches.

It is well known that poultry tick will remain alive for two years or more without recourse to the fowl for food. Indeed, they have been found alive in woodwork and fences after poultry have been away from the premises for several years. It will therefore be seen that complete eradication of the pest, once it has become established, is extremely difficult.

The effect on birds is very severe. The ticks not only cause them great discomfort at night, and consequent loss of sleep, but they may also introduce a harmful organism into the blood. This organism multiplies very rapidly, and produces a complaint known as tick fever, which often results in death. The general symptoms of this tick fever are a rise in temperature, restlessness, blackness, and shrinkage of comb, prostration, and paralysis.

Methods of Stamping out the Pest.

If infested houses are not properly constructed, or are of little value, it is better to burn them, and rebuild on new ground. The ground where the old structure stood should be saturated with a strong disinfectant. It is recommended that houses in tick-infested areas be constructed of iron, with the woodwork on the outside, if possible. Angle or tee-iron should, where practicable, be used in place of wood. For *economic reasons all houses should be built so that, in case of an out*break, they can be readily dismantled. They should also be built away from any other buildings or structures. Any wood used must be carefully selected, and should be as free from cracks as possible. In any circumstances, it should be coated with hot tar.

The perches, too, should be coated with tar, and they ought to be so *made that they can be easily dismantled. It is well to remove them* every now and again, for there is always the possibility of ticks finding a hiding place between the perches and the walls of the house.

Perches can be suspended by wire from the roof, and metal cups, filled with a liquid disinfectant, may be soldered to each wire to prevent the tick from reaching the perches. These cups can also be fitted to most types of perches.

Pepper trees with their loose bark have been known to harbour large numbers of the pests. Ticks will travel along an infested fence to a new poultry house, and they and their eggs may at times be conveyed from place to place by egg cases, crates, utensils, vehicles, wild birds, &c.

A thorough inspection of the poultry farm and plant should be frequently carried out. Regular spraying with a good disinfectant, such as sheep dip, will help to prevent the tick from getting a start. But once the pests have established themselves, it is almost hopeless to expect to reach every crevice where they and their eggs are concealed. If, during the spraying process, only a few specimens are missed, it may not be long before a heavy infestation occurs, for they multiply very rapidly.

The joints of the perches and crevices of the surrounding woodwork should be regularly treated with sheep dip used at full strength. The floors of the houses should be regularly and properly cleaned, and rubbish of all kind, both from inside and outside, must be burned.

If proper precautions are taken, it is quite possible, even in a tick-infested area, to establish a poultry farm which may be kept permanently free from the pest.

The regulations under the Stock Diseases Act require that all outbreaks of ticks be reported immediately to the Chief Veterinary Inspector, Department of Agriculture, Melbourne.

XVIII.—TURKEY REARING.

The rearing of turkeys for the table can be successfully carried on in the northern areas of Victoria with less trouble and expense than is generally supposed, and many womenfolk there are earning big sums in this way. In the Goulburn Valley, for instance, large quantities

American Bronzewings.
(Mr. T. McCrum, Kyabram.)

of wheat, oats, and lucerne are grown, consequently there is a good food supply, and climatic conditions are particularly favorable for this branch of poultry farming.

The essentials for success are sound, healthy breeding stock, careful feeding and management of the young birds and marketing at the right time.

Pure American Bronzewing turkeys are the most satisfactory. The breeding stock should consist of half-a-dozen hens from 14 to 16 lbs. weight, mated in their second season with a gobbler not less than twelve months old, and from 24 to 32 lbs. weight. Males of this weight are more satisfactory than heavier birds of from 36 to 45 lbs., as the latter do not fertilize so well, and frequently injure the hens. Hens may at times be so badly torn that the wound has to be stitched.

Although it is comparatively easy to remove the spurs of the male birds, it may be found more satisfactory to use boots. Almost any saddler will make them from a bit of green hide for a couple of shillings, and if taken off at the end of the breeding season, cleaned, and given a good dressing of neatsfoot oil, they will last two or three seasons.

The boot should be made the shape of the finger of a lady's glove, of a length equal to the bird's spur, with two small buckled straps to fasten round the leg. If a wad of sole leather (a piece out of a saddler's punch) is put inside the end of the boot, it will prevent the spur from wearing a hole in the end of it. Should the bird's spurs be very sharp, the points may be filed, and the life of the boots will thereby be prolonged. When filing the points, care should be taken not to make them bleed.

The gobbler should be a bird of robust constitution, with good, wide shoulders, long in the breast, and short in the leg. If such a bird is mated with hens of the weight stated, tight and close in feather, offspring of a suitable size to bring the best prices in the Melbourne market should be produced.

Where possible turkeys should be encouraged to roost in trees. It is good for the birds to use their wings, as it develops the muscle and makes the breast thicker. Turkeys roosting in the open air breed strong, healthy chicks, and the greater the range the stud birds have the stronger the chickens will be.

Turkey hens always choose their own nests. The eggs should be gathered daily, one being left in the nest. It is advisable to pencil the date on the eggs, so as to make sure of leaving the new-laid one for the *nest egg. The eggs, when collected,* should be kept in a cool place, and turned every day.

When the hen goes broody, a coop with a run attached should be placed near the house in a sheltered position on a patch of grass or lucerne. The nest should be made by putting 2 or 3 inches of soil mixed with a little lime in the bottom of the box, and a small depression made about the depth of a soup plate by patting down the earth with the hand; then a handful of pine needles or straw should be put in. The earth must be spread fairly evenly over the whole box a little higher at the edges than in the centre, and too much straw should not be placed in *the nest, otherwise the eggs may roll out. The eggs should* be put in the nest, and the hen placed on them at dusk, and closed in for about 22 hours; then the sitter may be given water and food consisting of either wheat, oats, or maize. After two or three days she may be let out, and can usually be relied upon to go back to the nest after having had a dust bath and a green pick. Broken charcoal and grit should always be kept near the sitting hens. Sixteen eggs are sufficient. If she has laid more, up to nine can be put under a domestic hen, which should be set at the same time. A record of the date when the hen is set should be kept by marking it on the coop, or in such other way as is most convenient. *The chickens should all be given to the turkey mother,* as she will make a much better job of the rearing of them. About two

days before the hatch is due, the hen should be gently lifted off and given a dusting with a good insect powder, and then allowed to feed By the time she goes back to the nest she will have got rid of any vermin with which she may have been infested, and the chicks will get a fairly clean start. Turkeys should always be handled very gently. For this reason, womenfolk are more successful with them than men. When the chicks arrive, they do not require food for at least 24 hours, but the mother should be liberally fed on any whole grain, as she will probably not have taken any food during the last day or so of the hatching Some powdered charcoal and coarse sand or fine grit should be placed for the young ones to pick at. Their first feed should consist of chick feed mixed with a little milk. The drier the feed is mixed the better, and it must not be sticky or sodden; only about three tablespoonfuls should be mixed at a time; a dessertspoonful of milk is sufficient to take up the flour in such a quantity and prevent waste. The first drink may be milk. It is well to place the milk in a saucer, in which an old cup has been inverted to prevent the chickens from standing in it. Separated milk will do. It would perhaps be well to mention that the more milk young turkeys get the finer will be the texture of flesh.

The coop should be moved a few feet every day to give the chicks fresh ground to run on; about the fourth day, the front of the coop should be raised a few inches to allow them to run in and out, but the hen should still be kept inside. At this age, a little finely-chopped green lucerne or lettuce should be added to the mixture, then chopped onions or shallots, and silver beet, milk thistles, or dandelion, will make a good change.

At the age of one month, a mash made of bran, mixed with water in which rabbits or liver have been boiled, and dried off with pollard and chick mixture, may be given them. To this chaffed green lucerne, rape, or other green stuff should be added. To prepare this mash, the bran should be placed in the trough and scalded with an equal measure of the soup, a bag being placed over it to keep in the steam for 10 or 15 minutes. Then chick mixture and pollard, equal to about twice the quantity of bran used, will be necessary to dry the feed off to a nice crumbly mixture. The green stuff can be mixed with the feed after the pollard.

Only as much as the birds are likely to pick up should be prepared. It should be fed in troughs, or on a clean bag spread on the ground, so that any food not eaten may be taken away and not left to go sour.

The chicks should be fed five or six times a day for the first three weeks. During this time, a little cracked grain may be fed to them at night. When they are a bit older, three or four feeds a day will suffice. At the end of six weeks, whole wheat and oats may be given. Cracked maize is also beneficial.

The changing of the feed should be done gradually; many a promising brood has been lost through neglect of this precaution.

Young turkeys should not be let out of their shed till the dew is off the grass, since allowing them to run in damp grass and get wet across the back often proves fatal.

They should be examined frequently for vermin, especially about the head. If any are found, a good plan is to get a small oatmeal bag,

put therein some good insect powder, place the young bird in the bag, and shake gently. This operation takes only a few seconds, and well repays the trouble.

The growth of the flight feathers of turkeys is very rapid. This is, no doubt, a provision of nature to aid the young turkeys in fleeing from their enemies, as when frightened they use these feathers at a great rate to increase their speed. If the six flight feathers of each wing be removed, the chickens will develop more quickly.

In performing the operation, great care has to be used not to injure the wing, but if the chicken be placed in the palm of the hand, and the wing held firmly between the finger and thumb, the feathers can be easily pulled out without any injury.

When the young birds are ten or twelve weeks old, a trestle frame should be made about 2 feet from the ground for them, on which they may learn to perch. The perches should not be less than 2 inches wide, and if placed near a tree the birds will soon learn to get into its branches. From this time on they should always have a full feed of grain at night.

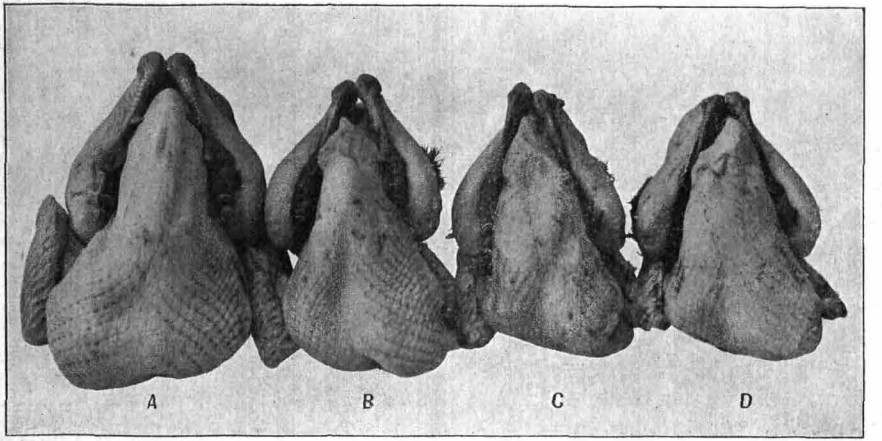
Three weeks before marketing they may be fed on grain which has been soaked in milk for from sixteen to twenty-four hours. Some people prefer to give them boiled wheat or barley, but I think the former the better feed.

Many make the mistake of sending their birds in for sale before they are ready. It is well to remember that it is not so much size that counts with the buyer as condition. A plump, well-conditioned bird of 20 lb. will always sell better than a large-framed, poor bird, even if he weighs a few pounds more.

It is wise to pick a reliable salesman and to send all birds to him. If birds are in good condition, he will be able to recommend them to his best customers to the seller's advantage; and once a person has acquired a reputation for selling only first-grade birds, buyers will always be on the look out for his consignments.

Crooked Breasts

Farmers breeding turkeys for the Melbourne market are, in many cases, not getting as profitable returns for their birds as they would if a little more care were exercised in the selection of breeding stock, and in the care and marketing of the young birds. No matter how fat they may be, birds with crooked breasts are of absolutely no use for export, and the best class of poultry-buyer will not purchase them for local consumption, as caterers require for their best customers only birds with sound, straight, plump breasts. Poultry auctioneers in the city are often blamed for not getting the prices expected by consignors, when it is the consignor's fault in sending birds that, though in plump condition and of good weight, have crooked breasts. The best buyers attending the various auction rooms are keen business men; they thoroughly examine the birds before the sales begin, and are quick to notice faults and limit their bids accordingly; but for birds of tip-top quality, without faults, there is always vigorous competition.



A.—Well-breasted Turkey. **B, C, D.—Turkeys with Crooked Breasts.**

With a little care, turkey breeders could do a great deal to improve matters in this respect; in the first place, by examining their breeding stock, particularly the males, and discarding all birds with crooked breasts.

Young turkeys may often be seen roosting on paling fences, or on perches made from the small branches of trees; this is most injurious to them, and in most cases means the ruination of their breasts. The perches of young turkeys should never be less than 3 inches wide, and a 6-inch board is better.

The use of a stud bird with a bent breast means that many of his progeny may inherit the unfortunate characteristic. In the illustration on page 180, the bird (B) was the sire of the birds (C) and (D). These two sons inherited the crooked breast of their father, and although the three of them were plump well-conditioned birds, the shape of the breast prevented their bringing top prices. The bird (A) in the illustration has the class of breast desired by the best buyers. Such birds will always realize good prices, either for export or for the best local trade.

Loss by Careless Crating.

Another cause of loss to the breeder is careless crating by overcrowding and putting turkeys into crates too small when sending them to market. To land turkeys in Melbourne in the best condition, only turkey crates should be used. The measurements of these crates are 4 feet x 2 ft. 6 in. x 1 ft. 9 in. Not more than eight gobblers should be put in one crate; if they are extra good, say average weights of 23 to 25 lb., seven is enough; not more than ten hens should be put in any crate. The crates should have at least 6 inches of straw in the bottom; this will make them more comfortable for the birds; and thus they will lose less weight on the journey; it also lessens the risk of birds receiving injury to the skin of the breast—injuries which make the best of breasts unsightly when dressed; this is another little point that does not escape the eye of the prospective buyer.

XIX.—BREEDING AND MANAGEMENT OF DUCKS.

Duck raising can be conducted successfully in a small way either as a side line or as an adjunct to other branches of poultry farming, but on a large scale it is a business requiring capital and wide experience. The cost of feeding the growing ducklings, and of maintaining the breeding stock during the rest of the year has to be considered, as during this time there is little return for eggs, and the cost of production is high. The beginner should start in a small way, and extend as he gains in experience. Ducks can be raised at a profit on the general farm, and, though not so great a source of income as fowls, serve to add variety to the meat and eggs on the farmer's table.

A suitable site for a duck farm is a gentle easterly or north-easterly slope with light sandy soil, and there should be sufficient land for the growth of green food. Shade is essential, and the birds should be protected from the cold winds. The ducks should be bedded down with sawdust, straw, or other litter during the laying season so as to keep the eggs clean. Ducks lay their eggs early in the morning, and

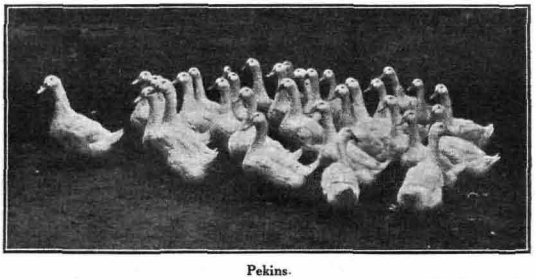
they should therefore be kept confined to their houses or pens until 9 or 10 a.m.; thus all eggs will be laid in the houses. They begin to lay when between five and five and a half months old. Ducks and fowls should not be run together. In handling the birds pick them up by the neck rather than the legs, as the legs are apt to break easily. Cleanliness and strict attention to detail are necessary to complete success.

Breeds.

With the exception of the Muscovy, all our economic breeds of ducks are said to have originated from the Mallard or wild duck. There are two general classes—the meat class, which includes the Aylesbury, Pekin, Rouen, and Muscovy; and the egg class such as the Khaki Campbell and the Indian Runner.

Aylesbury and Pekin.

These breeds are the most popular of the heavy varieties, and are suitable for the market, for export, and for table use. On account of the yellow colour of the flesh of Pekin ducks, they are generally crossed



Pekins.
(Mr. P. Briggs, Moorabbin.)

with an Aylesbury drake, a cross which matures quickly, and grows to a large size, with flesh of a good flavour, colour, and texture. Pure bred stock should be purchased, and the eggs hatched from birds on one's own farm.

Muscovy.

Muscovy ducks, whether pure bred or crossed with Pekins or Aylesburys, have very deservedly acquired a reputation for table purposes, and when fattened and dressed are very attractive in appearance. They would not, however, find such a ready sale on the English market in competition with Aylesburys and Pekins. Muscovy ducks have a quiet temperament, and do not run about much, or lose condition by excessive

exercise. Hence they can be kept with fair success while the local prices are good. They are good sitters and careful mothers; and divide into two general varieties—white and coloured.

Khaki Campbells.

Khaki Campbells.
(Mr. M. G. Leech, Campbellfield.)

According to Captain R. A. Long, a prominent English breeder, this breed was originated in 1901 by Mrs. Campbell, in Gloucestershire, and was produced by mating a Rouen drake with a Fawn and White Runner duck, some wild duck blood being added later. Mrs. Campbell writes of her ducks that they were meant for utility layers, not show birds, but that since some people wished to show them (and the birds must be bred to a definite type), she drew up a standard to which she desired their plumage to conform. Few birds, however, come up to this standard of perfection, although many are now bred for exhibition purposes; and it is surprising that the classes in both classic and local shows are so well filled, considering that the breed was originated for eggs and has achieved its popularity through the advertisement of its laying powers.

At egg-laying competitions, both in England and Australia, many individual ducks have gone over the 300-egg mark, and such records include one at Bentley (England) of 346 eggs in 365 days, while the highest sequence officially recorded is 225 eggs in as many days.

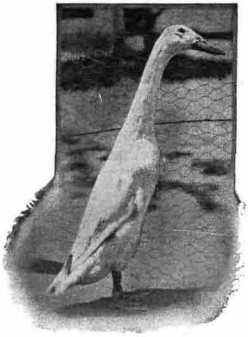
One duck at the Burnley Egg-laying Competition (Victoria) laid 123 first-grade eggs in the 122 days of the winter test (1st April to 31st July).

Indian Runners.

This breed is noted for its great laying qualities. There are three principal varieties, the White, the Fawn, and the Fawn and White. Although the quantity of flesh on them is not nearly equal to that on the larger breeds, a well fattened Runner is very fine eating. Where it is desired to run only a few ducks about the general farm or in the orchard, this breed is very suitable.

Accommodation.

The site for the houses must be dry, well drained, and raised a little above the general level. Buildings and pens should be constructed on labour-saving principles. Fairly open houses should be provided for the breeding ducks, and simple open fattening pens or houses for market birds. An earthen floor is the best for ducks. This can be constructed of clay, well rammed down, and when dry covered with tar and earth, or sand. Duck houses 10 feet deep, 16 feet long, 7 feet high in front, and 6 feet at the back, with yards 16 feet wide and 60 feet long, will accommodate about 50 ducks. Wire-netting can be used to confine them to



White Runner.

Fawn and White Runner.

their various yards. Suitable small ponds to serve two yards can be constructed of brick and concrete, 3 feet wide, 6 feet long, and 9 inches deep. They should be sloped at each end in order that they may be easily cleaned.

Breeding.

The best results are obtained by mating ducks of from two to three years old with a drake between one and two years old. The male birds used should be selected from a high egg-producing strain. The strongest ducklings are produced from eggs of well matured, strong, and vigorous stock. With one drake about three ducks can be mated in the heavy breeds, and as many as six in the lighter breeds. Ducks in breeding pens should be kept strictly to themselves, and comfortably housed in cold weather to ensure a normal egg supply. About 25 ducks should be run in each pen. They should not be forced in any way, and laying should be delayed until the breeding season of July, August, and early September. Ducks that have access to water will lay a greater number of fertile eggs.

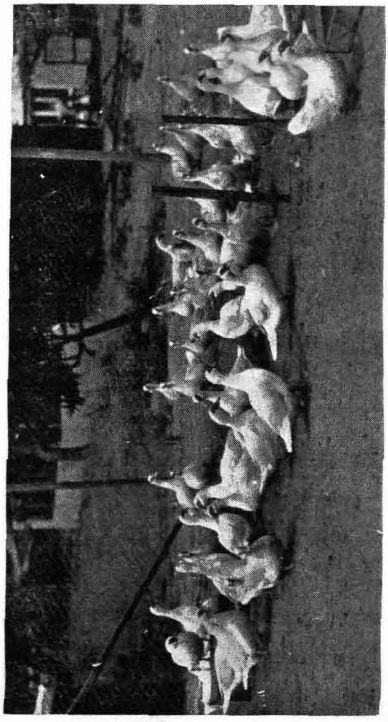
Incubation and Hatching.

Ducklings can be successfully hatched in incubators under the supervision of skilled poultrymen. They can also be hatched under hens, and brooded in the same way as chickens. The same general principles apply to the incubation both of duck eggs and those from fowls; but it is usual in the case of duck eggs to run the incubator at a temperature about 1 degree lower than that necessary for hen eggs. The directions supplied by the maker of the incubator can be followed in this respect. Most operators prefer to use the moisture tray during hatching, and the time the moisture should be supplied is governed largely by the situation of the incubator room and the locality of the farm. In localities with a dry atmosphere such as that north of the Dividing Range, a means must be found to increase the humidity in the machine either by wetting the floor of the room or supplying extra moisture in the machine. Eggs should be turned twice daily from the third to the twenty-sixth day inclusive, and the direction of the tray reversed each time the eggs are turned. The time necessary for the eggs to cool depends upon the temperature of the incubator room and the day of incubation; a good general plan is to leave them out of the incubator for five minutes during the first week and up to twenty-five in the last week. The eggs should be tested on the seventh and twenty-first days, and those infertile or with dead germs removed. All breeds, with the exception of the Muscovy, which require an extra week, hatch out in about 28 days. Muscovys usually hatch under the ducks themselves. All that is necessary to make a nest for the Muscovy duck is to place in a convenient position a box or small cask containing a little sand and litter. The duck will complete her own nest. Aylesbury, Pekin, Khaki Campbell, and Indian Runner ducks rarely sit; if natural methods of incubation are to be used, their eggs may be hatched under Muscovy ducks, or hens. This is a satisfactory method for the beginner, and in other cases where small numbers are concerned.

Rearing.

Where ducklings are raised on a large scale, the hot water pipe system is installed in a regular long brooder house. The brooders are the same as for chickens except that they should have more over-head room; the distance between the heating pipes and the floor should be about 8 inches. The temperature should be about 90 degrees F. for the first three days, and then can be gradually reduced. Between 30 and 50 is the number for each compartment. After the third week they can be removed to a warm place, and when they are half-grown can be removed to colder quarters. If they are to be reared in large numbers with coke-burning colony brooders, they can be kept in lots of 200 till they are two and a half weeks old, and thereafter should be separated into smaller lots until at a month old they are in lots of 50. Ducklings require careful attention up to about a month old, and after that they are very hardy. On a small scale the

newly-hatched ducklings can be kept in batches of about 50, housed in suitable accommodation, preferably with short litter, on which to camp at night, which should be kept dry.



A Nice Flock of Muscovys.

Muscovy ducks are best reared with the mother duck until they are from three to four weeks old.

Marketing.

Pekins and Aylesburys can be marketed when they are from nine to twelve weeks old, and weigh from 4½ to 6 lb., occasionally more. After the age mentioned the flesh deteriorates, and their weight decreases. Muscovys must be retained until they are between fourteen and sixteen weeks old. At this age they will, of course, be somewhat heavier than Aylesburys.

When ducks are being marketed they should, of course, be graded evenly as regards age, weight, and condition. Condition and uniformity are the qualities required to command top prices. Care should be taken not to place too many in one crate.

Ducklings for the English market are shipped from Melbourne during the months of November, December, and January.

Diseases and Parasites.

It is almost useless to attempt to cure any serious disease in ducks, and consequently the old motto—prevention is better than cure—applies with double force. The principal ailments met with are:—

White Eye.—This is a disease analogous to roup in fowls. It is very contagious, and is usually caused by overcrowding, and insanitary and damp conditions.

Staggers.—Ducklings that have been poorly fed, and not allowed a regular supply of drinking water often develop this complaint. In other cases it may be due to the absence of shade during hot weather.

Diarrhoea.—This trouble is usually the result of feeding sour or mouldy food.

Leg weakness and cramp due to damp conditions of housing, or to the drinking of very cold water, or chills, and which may result in pneumonia, are complaints methods of prevention of which should be obvious.

Lice and mites are not usually a serious consideration.

Feeding Ducks.

Ducks for egg production may be fed the following mixture:—

Wheat pollard	40 lb.
Oaten pollard or ground oats	20 lb.
Bran	30 lb.
Meat	10 lb.

Not less than 25 per cent. of succulent green food should be added to the above. The meat may consist of bullocks' heads and livers, and the soup from these mixed with the mash. Meat meal can be fed when these cannot be obtained. The mash should be fed morning and night, and possibly a little wheat at midday. If potatoes are available, up to 10 per cent. can be added to the mash. Ducks also relish boiled barley, which can be added to the mash at the rate of 10 per cent.

Clean water must be kept continuously before the birds, and the water should be deep enough to enable them to keep their eyes and beaks clean. If ducks are allowed to go without drinking water for even a brief period, they are likely to become overheated, and when later water becomes available they may drink an excess of it; this may cause "staggers," and many may die from cramp.

XX.—THE BREEDING AND MANAGEMENT OF GEESE.

The two principal breeds of geese are the Toulouse and the Embden. The standard weights are as follow:—

Toulouse gander, 20 lb. to 26 lb.; goose, 16 lb. to 20 lb.
Embden gander, 18 lb. to 20 lb.; goose, 16 lb. to 18 lb.

The Toulouse goose originated in Toulouse in Southern France, and is the largest variety known. In colour it is dark grey on the back, shading to light grey and white on the breast, and white on the abdomen. The eye is brown, the beak lightish orange, feet and webbing orange. The body is massive, broad and deep, of medium length, practically touching the ground. The female lays from about 18 to 36 eggs a year, but is not a good sitter.

The Embden goose originated at Bremen, and is pure white in colour, hardly as large as the Toulouse, but rather more upright. The female lays nearly as well as the Toulouse, but is a better sitter. The young goslings grow quickly and mature early. Where hatching by hens is practised, the usual custom is to give four goose eggs to one hen, the hatching period being about 30 days.

Geese subsist largely on grass, which they graze fairly closely, and other stock do not care to follow them on pasture land. They can be housed very economically as they need protection only from the wet.

Breeding.

Sex is not easy to distinguish in geese, but the gander is usually larger. The cry of the goose is somewhat shrill; the male has a more guttural note. He is also usually rather lighter in colour than the females. A male is best mated with not more than four geese.

The smallness of the geese in Victoria is partly due to the custom of breeding from very immature stock. They are not really mature until the third season, and may be kept on for another three or four seasons afterwards.

Hatching.

The eggs should be removed regularly as laid, and set under hens. If the eggs are not removed, the goose will stop laying sooner than she otherwise would. Eggs set under a hen should be turned regularly, as they are rather large for the hen to turn. About eleven eggs may be set under a goose. Though the use of incubators for goose eggs is uncommon, there is no reason why they should not be used. With goose eggs, the machines should be run at from about 101.5° to 102.5° Fahr., and kept rather more moist than is usual with hen eggs. The young goslings hatch somewhat slowly under hens, and should be carefully watched for head lice, to prevent which some lard may be smeared on the head.

Feeding Young Goslings.

No feed whatever should be given for the first 36 hours or so, though fresh water may be provided; also plenty of grit. Bread crumbs and milk may be given as a first feed, with finely chopped green

stuff. Barley meal, pollard, and maize meal may be given for the next two or three weeks, after which—if plenty of green stuff is available—they will need only about one feed a day.

Fattening for Market.

When being topped off for the market geese should be kept confined in small flocks of twenty or so, and fed on oat pollard, barley meal, and maize meal, with any separated milk that may be available, green feed also being fed once a day.

The birds should be disturbed as little as possible, and will put on an increase in weight of 4 or 5 lb. in approximately one month.

In America a system of hand feeding called "*noodling*" is practised, about ten geese being kept in a small pen of about 8 feet by 12 feet. The birds are hand crammed by the operator, who sits on a box with the goose between his legs, and stuffs the "noodle" or bolus down the goose's throat. They are fed up to five times a day at four-hour intervals, and the food is worked down by the hand on the outside of the neck. The "noodle" or bolus is about 2½ inches long, made of equal parts of wheat meal, oat pollard, barley meal, and maize meal.

From 50 to 100 geese per day can be fed in this manner by one man, though this will mean that his hours of work will be prolonged. The birds will put on up to 10 lb. increase in weight in a month, and the value per lb. weight is also much increased.

Killing.

Geese are usually killed by bleeding from the main artery in the mouth.

XXI.—ELEMENTARY STRUCTURE AND FUNCTION OF THE DOMESTIC FOWL.

It is useful to know something about how the body of a fowl is built up and also something about the functions of the various organs. A knowledge of the appearance of the organs can be obtained when one is dressing a bird for cooking.

To enable the busy poultry-keeper to quickly grasp the most important details of this subject, the information given must necessarily be of the simplest nature, and this has been kept in mind in the preparation of these notes. For more comprehensive work on the subject, the reader is referred to the publications of Dr. B. F. Kaupp.*

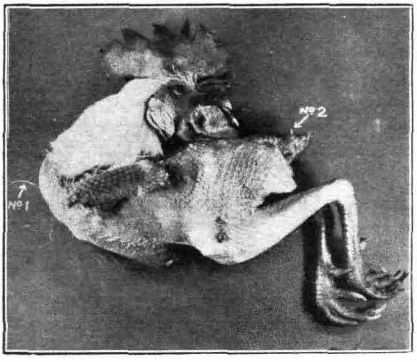
External Features.

The skin of the fowl is very thin, and contains neither sweat glands nor oil glands, with the exception of one gland, known as the oil or preen gland, situated almost at the end of the upper part of the back. This gland may be round or oval, and consists of two lobes, which can be seen by removing a portion of the skin. Oil is secreted from the

* *The Anatomy of the Domestic Fowl* (1918), *Poultry Diseases*, with a chapter on the anatomy of the fowl (1927).

body and collected in a cavity in the gland, and from there it passes out through a tubular teat. During the time it is preening its feathers, the bird, by squeezing out a quantity of this oil into its beak, oils the feathers, passing the beak over them one by one. It is stated by some authorities that it is necessary for the bird to oil its feathers in order to keep the plumage in the best condition. Other authorities, however, hold another opinion, and state that some birds have no oil gland. Poultry-keepers are familiar with the so-called rumpless fowls, and in birds of this kind the oil gland is absent. Heat is given off from the body of the fowl through capillaries (small tubes) of the skin.

The beak and the claws are modified skin—they are true horn material, and the naked part of the leg is covered with scales.



No. 1.—The so-called hairs, which are really feathers, can be seen plainly on the breast of the bird in the illustration.
No. 2.—Oil gland.

The feathers of birds are light, horny outgrowths, and serve the same protective purpose as does hair on mammals. They may be considered of two chief kinds—the clothing feathers and the quill feathers. The most rudimentary feathers are known as down. A quill feather consists of two principal parts—the stem or shaft, and the web or vane. The stem is made up of the quill and the central shaft, and to the latter the web is attached. This web consists of a large number of barbs which project from each side of the central shaft, and extending from these barbs, nearly at right angles, are smaller processes called barbules. Again, extending from these barbules are still smaller processes called barbicels, and these often end in small hooklets, called hamuli, which can be seen only under the microscope. The barbules and hooklets hook together the barbules on the next barb, uniting the

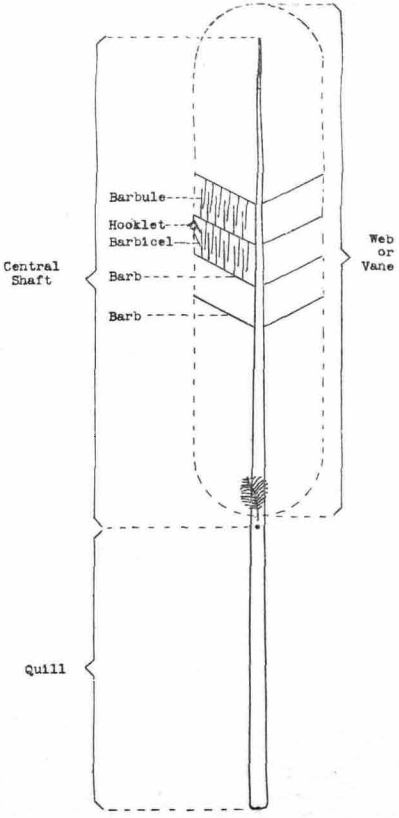


Diagram of a Quill Feather.

The quill and the central shaft make up the shaft or stem of the feather.

whole series of processes into a web or vane. Absence of the hooklets causes a feather to be soft. The down feathers are loose and fluffy, and give great warmth to the body. In this kind of feather the shaft is weak, and the barbs are not provided with barbules or hooklets. All feathers are built up on the same general plan. There are other small feathers, often spoken of by many people as hairs. These are seen distributed over various parts of the skin of the bird when plucked, and are those that are singed off in preparing a bird for the table. These so-called hairs are feathers with a very slender and weak shaft, and with very few barbules; they are known under the name of filoplumes. Feathers do not spring from all parts of the body, but are arranged in definite areas or rows. The intervening tracts are devoid of feathers, but, of course, are covered over by parts of the other feathers. The smaller feathers cover various parts of the body, while the larger feathers and the quills are confined to the wings and the tail. The longest quill feathers are those attached to the hand (end segment of the wing), called the primaries. Those attached to the forearm (next segment) are called secondaries. Other details of the points of a fowl are to be found in text-books.

Once a year, usually in the late summer or in the autumn, the entire feather coat is changed. This process is called moulting, and during this time the hen almost always ceases laying. Fowls also moult at other times to a limited extent. Dr. Kaupp has pointed out that it has been recently established by Rice that the young fowl, in reaching a stage of egg production, moults five times before the laying period begins.

Internal Features.

The body is made up of a large number of parts, each of which has its own particular function to perform. These parts are called organs. Thus we speak of the heart as an organ of circulation; the lungs as an organ of respiration; and the muscles as organs for producing motion.

The various organs of the body may be conveniently arranged in groups or systems, according to their respective function.

The System of Organs.

Bony System (Skeleton).—Backbone, ribs, breastbone, bones of the skull, shoulder bones, bones of the hip, bones of the limbs.

Muscular System.—Voluntary muscles, involuntary muscles.

Circulatory System.—Heart, arteries, capillaries, veins.

Respiratory or Breathing System.—Nostrils, nasal chambers, pharynx (throat), superior larynx, trachea (windpipe), inferior larynx (voice), bronchi, bronchial tubes, lungs, air sacs, air spaces.

Nervous System.—Cerebro-spinal: brain, spinal cord, nerves. Sympathetic: ganglia, nerves.

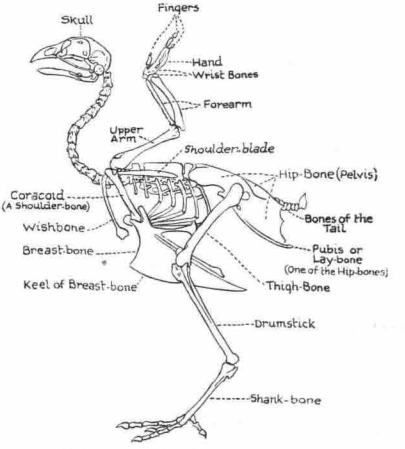
Digestive and Absorptive System (Alimentary Canal).—Mouth, pharynx (throat esophagus (first), crop, esophagus (second), proventriculus (glandular stomach), gizzard (muscular stomach), small intestine, caeca (blind pouches), large intestine (rectum), cloaca, anus (vent). Accessory organs: beak, tongue, liver, pancreas, spleen.

Urinary System.—Kidneys, ureters, cloaca, anus (vent).

Reproductive System.—Testes, ovary, vas deferens, oviduct, cloaca, anus (vent).

Sense Organs.—Eyes (seeing), nose (smelling), tongue (tasting), *ears (hearing), skin (feeling), feathers (feeling).*

In addition to the various organs included in the systems which are described below, there are also tissues and membranes which serve to cover and line, and also connect and support, the various organs. For instance, the peritoneum is a membrane which lines the inside of the body and covers the visceral organs (various internal organs).



Left or near half of the Skeleton of the Fowl.

Then there are cells; everything in the body is built up of cells. There is cartilage or gristle, which takes the place of bone when an elastic or yielding substance is required. For instance, cartilage pads are found between the vertebrae (segments of the spinal column or backbone). Ligaments and tendons (or sinews) are tough cords which bind the various joints and other parts of the body together. There are also the various glands for secreting a substance or substances to be used in or eliminated from the body, as the salivary glands and the thyroid gland, which stimulates the whole body processes.

Bony System (Skeleton).

The bony system consists of a large number of bones which constitute the skeleton, and form a strong framework which supports and protects the softer structures of the body. These bones are connected so as to form joints, and are bound together firmly by strong fibrous bands, called ligaments. In some parts of the body where an elastic and yielding substance is required, gristle takes the place of bone.

In the bones of young birds there are cavities filled with marrow. In the adult, these cavities are largely filled with air, which passes from the respiratory (breathing) organs into these cavities. The air spaces are more abundant in the larger bones.

The skull contains 31 bones, and is divided into the cranium, which encloses the brain and contains the organs of hearing. The face, placed in front of the cranium, comprises the skeleton of the jaws. In this region are the external openings of the nose and eye sockets.

The backbone, or spinal column, which encloses the great nerve (the spinal cord), forms a kind of axis with which all other parts of the skeleton are connected, and is composed of a series of segments. The neck portion, consisting of fourteen segments, is flexible, so that it is possible for the beak to reach any part of the body. The first segment next to the skull is the smallest, and it has a ball-and-socket joint, which makes possible movements in all directions. The body of each succeeding segment is longer than that of the preceding. Between the segments are pads of fibrous cartilage (gristle).

The next portion, the seven segments of the back, which carries the ribs, aids in forming the roof of the chest cavity. Next is the portion which partly forms the roof of the pelvic cavity, and consists of fourteen segments, which are distinct in the baby chick, but become fused shortly after hatching. The last seven segments constitute the bones of the tail, which are all freely movable, except the first. The last segment, shaped like a ploughshare, is the largest, and supports the oil gland and the row of main tail feathers. The bones of the second section of the spinal column, i.e., the back portion of the spinal column, the ribs, and the breast-bone or sternum, form the thorax or chest cavity. These with other minor attachments give great protection to the internal organs. There are seven pairs of ribs, which are arranged in order of length, the last pair being the longest. The first, second, and sometimes the seventh, are termed floating, or false, as they do not touch the breast-bone. The others are connected with the breast-bone, and are called true ribs.

The breast-bone or sternum forms the floor of the thoracic cavity. It is a large four-sided plate of bone, the back portion of which overlaps the ribs on the outer side. The breast-bone is extended into a leaf-like ridge, commonly known as the keel. This serves the important function of increasing the bony area for the attachment of the powerful muscles which move the wings.

The bones of the shoulder consist of the shoulder-blade, the wish-bone, and the coracoid. The shoulder-blade lies on the outer rib surface, near and parallel with the "back" segments of the spinal column.

The wish-bone, or merrythought (collar-bone), is united to form a V shape on the outer chest region. Behind this another bone (the coracoid) is the strongest of the shoulder bones.

The fore-limb of birds is modified for the purpose of flight, and is commonly known as the wing. The first bone, next to the body, is termed the upper arm. Next is the forearm, made up of two bones. Next, the two small bones of the wrist, followed by the hand with its three rudimentary fingers. The first, called the thumb (also called the (false wing-bone), consists of but one segment with a tubercle (a small knob) on the end. The second, middle, or large finger, the best developed, consists of two segments. The third finger, the smallest, has only one segment.

The Bones of the Hip.

The pelvis is voluminous, and very strong. The three pairs of bones comprising it, together with the pelvic portion of the backbone, form a thin, irregular, shell-like structure extending from the tail to the thoracic region.

The hind limbs support the body. The first bone adjoining the body is the thigh-bone. The second bone is often spoken of as the drumstick. Next is the shank-bone. Most of the domestic fowls have four toes, but in some breeds, such as the Dorking, there are five. In fowls with four toes, the three principal toes, the second, the third, and the fourth, are directed forward, and the first is directed backward. The first toe, called the great or hind toe, is directed backward. The second, or internal toe, is directed forward.

The Muscular System.

Movements are made by the muscles (organs of locomotion). Muscles do not move of themselves. The bird controls its limbs, and moves them at will. The bird does this through its brain, which is connected with all its muscles by means of nerves. Nerves pass from the bird's brain all over the body to the muscles, and when it wishes in its brain to make any movement, the brain sends down messages to the muscles which move the legs or other part of the body, and they make the movement desired.

Muscles are highly specialized structures which have the property of contractibility when stimulated, and thus produce motion. Movements, then, are made by muscles contracting and moving bones and joints, and the muscles are made to move by nerves, which carry messages or "impulses" from the brain.

Two kinds of muscles are recognized: voluntary and involuntary. We have examples of voluntary muscles in those of the limbs. The muscles of the heart and the stomach are of the involuntary kind.

In the fowl there are 162 muscles, single or in pairs. Some of their functions are—To open the jaws, to close the jaws, to open the eyes, to close the eyes, to rotate the eyeball, to move the limbs, &c. The large breast muscle is powerfully developed for the purpose of moving the wing.

The Respiratory or Breathing System.

In the fowl, which breathes through its nose, the organs of respiration or breathing are the nostrils, nasal chambers, pharynx (throat), superior larynx (attached to the upper end of the windpipe), trachea (windpipe), inferior larynx (attached to the lower end of the windpipe), bronchi, bronchial tubes, lungs, air cells, air sacs, and air spaces of the bones.

The nostrils of the fowl open externally by two small openings in the upper mandible. The nostrils communicate with the nasal chambers, and the latter with the mouth cavity through a slit-like opening in the roof of the mouth. The superior or upper larynx is connected to the trachea (windpipe) at the base of the tongue. The trachea (windpipe) is a passage for air alone, and terminates in the inferior or lower larynx. As indicated above, the fowl has two larynxes. The inner surface of the superior or upper larynx is smooth, and does not contain vocal chords; it is in the fowl simply a passage for air. The inferior or lower larynx is called the true larynx, and is the larnyx used in making a sound, as in crowing, cackling, or singing. It contains two membranous folds, which in the production of sound are caused to vibrate. The larynx at the upper end of the windpipe is pierced by a slit-like opening, which is provided with two lips. These are controlled by two pairs of muscles, and when brought together tightly, close, so that nothing can fall through into the windpipe during the time the bird is feeding and drinking. The bronchi, two in number (right and left), proceeding from the larynx at the lower end of the windpipe, enter the lungs, and are subdivided into smaller and smaller tubes, called bronchial tubes, which penetrate every part of the lungs, and finally terminate in groups of air cells. There are given off from the lungs nine air sacs, eight of which are in pairs. They are bladder-like structures, with delicate walls, and are best developed in those birds which fly most. Some of the air sacs give off air extremities which enter into the bones.

The process of breathing is called respiration, and consists of two acts—inspiration, or drawing the air into the lungs, and expiration, or expelling the air from the lungs. Dr. Kaupp states that the male of average size breathes 20 times per minute, and the female 32 times a minute. Slight excitement or uneasiness increases the breathing and the pulse rate. Heat from the body is eliminated largely through the lungs, and by radiation from the surface of the fowl from capillaries (small tubes) of the skin, there being no sweat or oil glands in the skin of the fowl except the single oil gland in the region of the tail. When the body surfaces rise in temperature, as in hot weather, the respiration increases, and the bird may open its beak to facilitate the rapid exchange of a sufficient amount of air to carry away the excess heat. The more rapid exchange between heated and cold air, the sooner the body temperature is reduced. The bird must always be supplied with fresh air, as it is in the lungs that the blood is purified after passing through the body; that is, the carbon dioxide is taken out by the air of the lungs, and oxygen is absorbed into the blood from the air.

The Circulatory System.

The circulatory apparatus consists of two tubular systems—the blood system and the lymphatic system.

The blood system consists of the heart, the arteries, the veins, and the capillaries (minute blood vessels). The heart is a muscular organ provided with valves. It serves as a kind of force-pump to distribute the blood to all parts of the body. Internally, the heart has four chambers, two of which are termed auricles, into which the blood is received, and two ventricles, from which it is despatched. The arteries convey blood from the heart to the tissues, and they divide and subdivide into smaller and smaller branches, till at last they form very minute blood vessels, called capillaries. The capillaries unite, forming small veins, and by the junction of these, larger and larger veins are formed, which at length discharge their contents into the heart. The course of the blood, then, is as follows:—Arterial blood leaves the left ventricle of the heart to be distributed throughout the body, and is returned through the veins to the right auricle of the heart. From there the blood then passes to the right ventricle, and then to the lungs, to be purified by the breathing process, and later returned as purified blood to the left auricle, and then to the left ventricle again, and the whole process is repeated.

The lymphatic system consists of capillaries and veins alone. As in the blood system, the lymph capillaries collect the used-up material from the tissues in all parts of the body and pour it into the lymph veins, and these in turn carry it to the large blood veins shortly before they empty their contents into the heart.

The chief function of the blood is to nourish all the tissues of the body, and thus aid in growth and repair; to furnish material for the various body processes; to supply the body with oxygen. Blood is in constant circulation, its contents being continually replenished from the food substances absorbed through the capillaries of the intestines, and at the same time a process of purification is going on, chiefly in the lungs, kidneys, and bowels. The lymph vessels, as already explained, carry used-up material to the blood.

There are three kinds of blood cells, viz., red-blood cells, white blood cells, and a third kind. An important function of the white cells is the protection of the body against bacterial invasion. They have the power to destroy bacteria. Red-blood cells in the fowl range between 3,000,000 to 4,000,000 in a quantity of blood equal to 1/50th of the volume of a drop of water, and the white cells number 25,000 to 30,000. Blood from a vein has a purplish tinge, due to impurities, while that from an artery is a bright scarlet, the colour change being the result of its purification in the lungs.

The contraction of the heart causes the blood to be thrown into the vessels in jets, and this is felt on the arteries of the body as the pulse. The frequency of the beating varies considerably with age, activity, and various other circumstances. In the normal man at rest, the rate is about 70 to 75 per minute. According to Dr. Kaupp,

the heart of a fowl beats 350 times a minute; therefore, the pulse rate of the fowl is 350 times a minute. In Newton's *Dictionary of Birds* it is stated that the pulse rate in birds is much quicker than in any other animals, numbering in some species of wild birds about 120 to the minute when the bird is at rest; when it is flying, even the first stroke of the wings nearly doubles the rate of pulsation.

Professor Fronda, University of the Philippines, found that the average temperature of a normal fowl, regardless of the breed, varied from 104.6 to 109.4° F. The highest temperature, in general, was reached between 12 noon and 4 o'clock in the afternoon, and the lowest occurred at night.

The Nervous System.

The nervous system consists of two parts, called the cerebro-spinal system and the sympathetic system. The cerebro-spinal system consists of the brain, spinal cord, and the nerves given off from the brain and the cord. The sympathetic system consists of a number of ganglia (knots) or nerve centres, that extend along either side of the spinal cord, and give nerves to certain internal organs, blood vessels, and other involuntary parts.

The nervous system is an apparatus by means of which animals appreciate and become influenced by impressions from the outer world. Animals act on these impressions, and thus are enabled to adapt themselves to their environment. Nerves act, as it were, as telephone wires, and carry "impulses." For instance, when the skin of the leg is touched, or cut, or burnt, the pain felt is carried to the brain along nerves, and when the leg is moved to avoid the pain or for any other reason, the impulse is carried down the nerves to the muscles. Nerve endings are widely distributed over the body, and impulses start when anything threatens to destroy the structure of adjacent living tissue, hence acting as danger signals, and giving the animal sensation of pain.

The skin when warmed gives rise to sensation of warmth, and when cooled causes a sensation of cold. In the ear impulses start when acted upon by waves of sound; in the eye, by light; in the mouth, when acted upon by certain chemical bodies, giving sense of taste; in the nose, when acted upon by certain gases, giving sense of smell. There are other nerve endings in the body which can start impulses under special conditions; for instance, those telling the animal that its stomach is empty, &c. Nerves, then, are means of communication between the ouside world, various parts of the body, and the brain, and between the brain and the muscles.

The Digestive System.

The digestive apparatus consists of the organs concerned in the reception of the food, in its passage through the body, and in the expulsion of the unabsorbed portion. This apparatus, known as the digestive tract or alimentary canal, can be regarded simply as a tube

which passes through the bird from mouth to anus (vent). As the length of this tube is always greater than the length of the bird, it follows that the tube in some part of its course is coiled. It consists of the following parts:—

> Mouth, pharynx (throat), first part of the esophagus (food tube), crop, second part of the esophagus, proventriculus (glandular stomach), gizzard (muscular stomach), small intestine, caeca (blind pouches), large intestine (rectum), cloaca, anus (vent). The accessory organs are—Beak, tongue, salivary glands, liver, and pancreas; some anatomists include also the spleen.

In the mouth of the fowl there are no lips, teeth, or jawbones; it consists simply of a beak. The tongue is situated in the floor of the mouth, and is narrow and pointed in conformity with the shape of the beak. The surface is thick and horny, especially towards the tip of the tongue. Various glands occur in the tongue, and also in the mouth. While not so freely movable as in mammals, the tongues of birds are very flexible.

The pharynx (throat) is directly continuous with the mouth, and joins with the first portion of the esophagus (food tube).

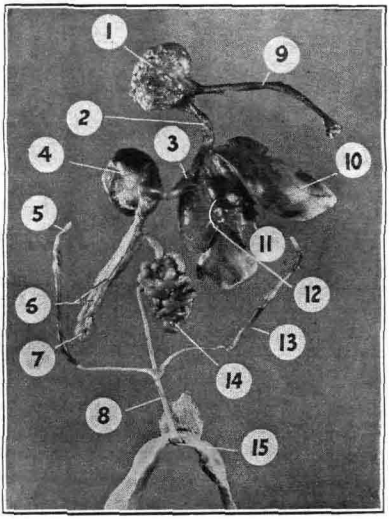
The esophagus is a tube capable of great distension, the function of which is to give passageway for the food from the pharynx (throat) to the crop, and from the crop to the proventriculus (glandular stomach). The crop, therefore, divides the esophagus into two portions, called the first and second portions respectively.

The crop is a storehouse for the food during the hours of feeding, the food when needed by the stomach being gradually discharged from the crop by contractions of its muscles. The crop is capable of great distension, and is lined with a mucous membrane containing glands which secrete a mucus to keep the surface moist.

The stomach of fowls is made up of two portions—the proventriculus (glandular stomach) and the gizzard (muscular stomach). The proventriculus (glandular stomach) is a continuation of the esophagus. Its function is to soak the food with a secretion. The gizzard (muscular stomach) immediately succeeds the proventriculus (glandular stomach). On each side, the gizzard has a powerful fleshy muscle, and the interior is furnished with a pale, thick, and horny lining, raised into ridges. The hard pads, operated by the powerful muscles, together with grit, act like millstones and make reduction of food to fineness very complete. The gizzard contains glands which secrete a strong acid fluid containing pepsum, which is mixed with the food, and makes gastric digestion complete.

The small intestine is the tube which connects the gizzard with the large intestine. The first portion leading from the gizzard is

shaped in the form of a loop, and is termed the duodenum, or the duodenal loop. The two branches of the loop, the first and second, or the descending and ascending portions, are loosely held by connective tissue, and have the pancreas (a gland) lodged between them. The second portion of the small intestine, called the free portion, follows the duodenal loop, and is arranged in coils in the abdominal cavity, being suspended from the wall of the abdomen by a thin membrane.



Digestive Apparatus of the Domestic Fowl.

(1) Crop. (2) Esophagus, second portion. (3) Glandular Stomach. (4) Gizzard (Muscular Stomach). (5) Caecum (Blind Pouch). (6) Pancreas (located within the Duodenal Loop). (7) Duodenal Loop (first part of the Small Intestine). (8) Large Intestine. (9) Esophagus, first portion (food tube leading from the Pharynx—throat). (10) Liver. (11) Gall bladder. (12) Spleen. (13) Caecum (Blind Pouch). (14) Small Intestine. (15) Cloaca.

called the mesentery. The function of the small intestine is that of digestion, after which the food is absorbed into the blood. This takes place through the blood vessels in the walls of the intestine.

The large intestine, sometimes spoken of as the rectum, succeeds the small intestine, and extends to the cloaca. It is short in length, but similar in function to that of the small intestine in that digestion and absorption may take place within it.

At the junction of the large and the small intestines the fowl has two caeca (blind pouches). They are larger toward the blind ends than at the part connected to the intestines.

The large intestine opens into an expanded portion just in front of the anus (vent), and this is called the cloaca. The ureters (tubules from the kidneys), the oviduct (the tube in which the egg passes through from the ovary in the female), and the seminiferous tubules carrying the semen from the testes in the male, also open into the cloaca. The function of the cloaca is to give passageway to the feces, the urine, and the egg, and to act as an organ of copulation.

The accessory organs of digestion are the liver and pancreas; some anatomists including the spleen also. The first two prepare fluids containing ferments, which aid in splitting or digesting the food.

The liver is a large, dark reddish-brown organ, soft and friable in texture, and is divided into two principal lobes, a right and a left, the right being larger than the left. One of its functions is to prepare a fluid called bile. This fluid is carried through ducts to the small intestine. The surface of the right lobe carries the gall bladder, in which the bile is temporarily stored.

The pancreas is another organ which prepares a digestive fluid. It is a yellowish-white gland, long in shape, situated in the curve of the duodenal loop (first part of the small intestine). It is held within the loop by a supporting connective tissue, and the fluid which it prepares is conveyed through ducts to the small intestine. In the gland it is said that an internal secretion is also produced.

The spleen is a reddish-brown organ, generally round in form. It lies in a triangle formed by the glandular stomach, liver, and the gizzard. Its function is the production of some of the constituents of the blood.

Summarizing the above, the course of the food then is as follows:— After being picked up by the beak, the food enters the mouth, passes through the throat and along the first part of the esophagus into the crop, without mastication as the bird is not provided with teeth. The food is stored in the crop during the hours of feeding, and when required by the fowl is passed out by aid of the crop muscles. From the crop the food passes through the second portion of the esophagus to the glandular stomach. Here it is soaked with a secretion before passing into the gizzard. After being finely ground in the gizzard by the aid of its powerful muscles, and by grit that has been picked up,

the food passes through the first portion of the small intestine (the duodenal loop), where it is subjected to the action of the bile from the liver and the fluids from the pancreas and the glands of the intestinal wall. The food is then passed into the caeca. The indigestible portions pass from the caeca through the large intestine, or rectum, to the cloaca, and thence to the external world.

The Urinary System.

The urinary apparatus of the fowl consists of two kidneys; from each, a duct called a ureter extends which communicates with the cloaca, the enlarged terminal portion of the large intestine just in front of the anus (vent).

The kidneys are located in excavations in the lumbo-pelvic roof. They are very soft, of a reddish-brown colour, and in the fowl of average size are about 2½ inches long and made up of three irregular lobes. The lobe nearest to the head of the bird is usually the largest and the middle the smallest.

The ureters serve as a passage way for the urine from the kidneys to the cloaca.

The use of the kidneys is to separate certain poisonous substances which have accumulated in the blood during its circulation throughout the body. These impurities are conveyed away from the kidneys in the urine.

The urinary secretion, as found in the ureters, does not contain much liquid. It is made up of a pasty material consisting of salts, which are mostly uric acid crystals and sodium urate. This material is represented by that part of the droppings of the birds which is white or chalky in colour.

The Reproductive System.

The reproductive apparatus in the male consists of the two testes, and a duct leading from each—the *vas deferens*. The testes are small, somewhat oval in shape, and are situated near the kidneys. The ducts run along the outer borders of the ureters and serve to carry the spermatozoa—the male fertilizing elements—from the testes to the cloaca.

The female reproductive apparatus consists of an ovary and an oviduct. In the pullet the ovary consists of a mass of 3,500 to 4,500 small, yellowish spheres. These are the undeveloped ova, which develop one by one into yolks. In the active ovary of the laying hen the ovarian mass is of considerable size, as it contains ova in different stages of development. When the yoke is mature it escapes from the enveloping follicle and drops into the entrance to the oviduct. The three separate portions of the egg—the albumen, shell-membranes, and the shell—are formed in different parts of the oviduct. Fertilization of the egg takes place in the upper or first part of the oviduct.

The principal parts of the egg are the yolk, blastoderm, albumen, chalazae, shell-membranes, and shell. The yolk is enclosed in a very delicate membrane called the vitelline membrane. Surrounding the yolk are layers of albumen of varying density. There is another kind of albumen which forms the chalazae. These are twisted dense cord-*like structures at either pole of the yolk, one end of which is adherent* to the vitelline membrane surrounding the yolk, and the other end to the inner shell-membrane surrounding the albumen. The chalazae act as stays to the yolk, which carries a delicate burden, the blastoderm, a small circular white patch in the yolk consisting of a disc of cells from which the chicken develops. The shell-membranes are made up of an outer thick and an inner thin layer, and are located just inside the shell to which they are closely adherent. These membranes are attached to each other except at the large end of the egg, where they separate, forming the air cell which gradually enlarges as the evaporation of the contents through the pores of the shell takes place. The shell consists of several layers. Three layers have been distinguished.

Sense Organs.

The five special senses are vision, hearing, smell, taste, and touch.

The olfactory nerve is the important part of the organ of smell. It receives impressions of odours and transmits them to the brain.

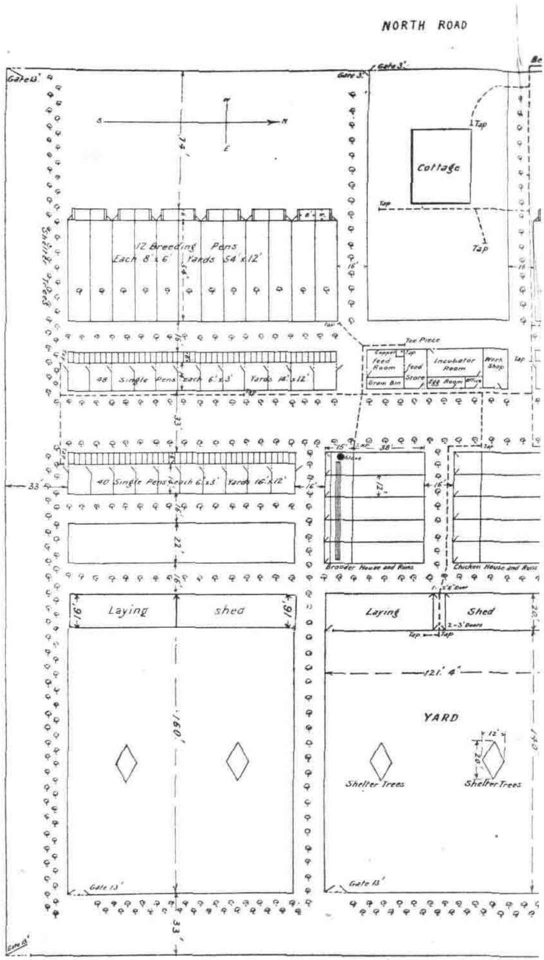
The most important part of the organ of taste is the tongue. The thick surface is little adapted for taste perception and, therefore, the tongue is not in birds so well adapted for the perception of taste as it is in mammals.

The outside parts of the organs of touch in the fowl are the skin and the feathers. Nerves providing the sense of touch are numerous in the skin.

The sense of sight in the fowl is well developed. The eye is relatively large for the size of the bird, and the eyeball is only slightly movable. The pupil is black and round in the fowl, and the iris contains a pigment which determines the colour of the eye. Birds have a third eyelid called the nictitating membrane, which is located at the inner corner of the eye and moves across the eye obliquely downward and backward. The tear duct lies in the inner angle close to the temple. Tears are secreted by the tear gland and drained from the eyeball by two small canals which extend into a sac. From this sac extends a tube which communicates with the nasal cavity.

Hereunder is an extract from *A Monograph of the Pheasants*, written by Mr. William Beebe as a result of a tour through India. Mr. Beebe's observations regarding the wonderful powers of sight and hearing possessed by the Red Jungle fowl, the ancestor of the domestic fowl, are very interesting.

"The senses of sight and hearing are those which protect the Jungle fowl from its enemies, the former dominant, while the ears are yet so keenly attuned that the least crack of a twig will often send the bird in headlong flight. Never have I seen a wild bird off its guard for a moment, and although I have lain prone and had a cock come within 10 feet, yet it was only because I was perfectly hidden and motionless. On this and on other occasions I have seen the bird under observation become suspicious and even finally take alarm when I was *absolutely certain that through none of its five senses had it received* warning of my presence. There seemed to be an intuition, a mental sensing of concealed danger, an indefinite conviction which gradually increased in power and assumed control of the bird's emotions, in spite of the fact that it had as yet no knowledge of the location or character of the peril. In such case, it was as likely to make its escape by [illegible] tion."



Plan of Poultry Yards and Water System, State R

Scale 1/64 inch = 1 foot. Water systems

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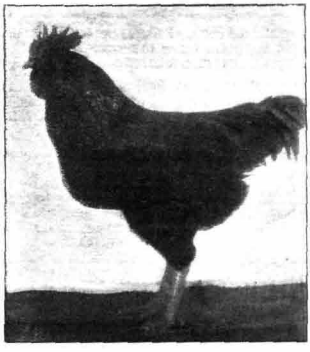

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