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POINTERS FOR STOCKRAISERS



PRICE 50 CENTS

PUBLISHED BY
DAVIS STOCK FOOD CO., CHICAGO, ILL., U.S.A.

THE WORLD'S BEST SHEEP SHEARING MACHINE



GET FROM HALF A POUND TO TWO POUNDS MORE WOOL PER HEAD.

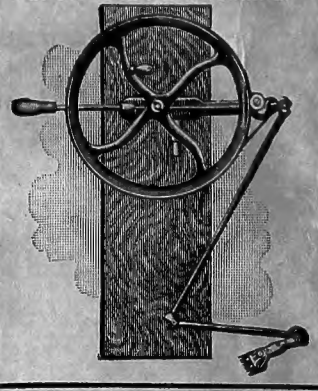
The use of the MARTIN Sheep Shearing Machine will get from 8 to 32 ounces more wool from every sheep you own than you can get by the old method of hand shearing. You can prove this statement yourself if you will take advantage of our free trial offer and refund proposition as explained on this page. After receiving one of our machines have the most expert hand shearer in the business clip one of your sheep as closely as he knows how, let him take all the time he needs to do a strictly first class close job of hand shearing, and when he has finished his work take the shorn sheep in hand yourself, use the perfect Shearing Machine you have received from us, and in five minutes time you can go over the same animal from its hoofs to its eyelashes and get an additional 8 to 32 ounces of wool. What you can do with one head you can do with all, which means from 15 cents to 60 cents additional income from every head of sheep you own. The Martin Sheep Shearing Machine clips closer, clips easier and clips better than any other method, machine or hand, and will add an average of one pound of wool to the fleece throughout your entire herd, an increase in wool yield which if you own a flock of 200 head means an addition to your WOOL PROFITS OF FIVE TIMES THE COST OF THIS MACHINE.

\$37.50 MORE WOOL FROM 200 SHEEP.

Our records show that on a herd of 200 sheep the use of this perfect sheep shearing machine will get at least 150 pounds more wool than can be gotten by hand shearing. At a conservative price of 25 cents per pound this would mean an increase in wool profits amounting to \$37.50, and in the face of this established record no stockman can afford to shear his sheep by the old method, because every ounce of wool he fails to get by hand shearing that he can get by using the Martin Shearing Machine represents just so much lost income, just so much lost profits, and on a large herd the loss would be tremendous. Owners of large sheep ranches have been most enthusiastic in praise of this specially valuable profit producing feature of the Martin.

\$11.95
IS OUR PRICE FOR THIS WONDERFUL SHEEP SHEARING MACHINE.

Ready to fasten to a post or board, as shown in this illustration.



GET MORE MONEY FOR YOUR WOOL TOO. If you will shear your sheep with the Martin Sheep Shearing Machine you will get better prices for your wool than you can get for it if clipped by any other method. The best wool grows close to the skin, and as this machine clips so closely that it gets from 8 to 32 ounces per head more wool of the finest grade that grows than can be gotten by any other shearing process, this increased weight, made up of the finest and highest grade wool, brings up the average quality of the whole clip to the very highest degree and wool buyers in every market pay top prices for it. Stockmen who use our machine are getting better prices for their wool than they ever received before, and better prices than are paid any sheep raiser for hand clipped wool.

\$12.00 SAVED IN SHEARING 100 SHEEP.

SAVE THREE-QUARTERS OF THE COST OF SHEARING. The Martin Sheep Shearing Machine will cut the labor cost of shearing your herd at least 75 per cent, and if you own 200 sheep you will save in wages usually paid hand shearers to do the same work enough money to pay for this machine twice over, and save a labor bill of \$25.00 every time you shear thereafter. Shearing by hand at the average price of 15 cents per head would cost you \$30.00. Two men with this perfect sheep shearing machine can shear 150 head per day, and at a fair daily wage of \$2.50 each, the expense of clipping 200 sheep would be \$6.67, a clear saving over hand shearing of \$23.33. The tremendous saving in wages for shearing larger herds can be seen at a glance. No sheep raiser can longer afford to shear by hand when for an investment of only \$12.95 he can save from 10 to 12 cents per head every year on every sheep he owns.

BUYERS AT THE STOCK YARDS pay a half cent a pound more for sheep sheared by the MARTIN Shearing Machine than they pay for sheep sheared by hand. The Martin shears so closely and smoothly. It leaves the stubble in such fine condition, that the general appearance of the animal is a hundred per cent better than that of the animal sheared by hand, and the stock yards people willingly pay a premium for sheep sheared by this perfect machine.

YOU CAN'T CUT YOUR SHEEP when you shear them with a MARTIN Shearing Machine, a claim which cannot be successfully made for any other shearing machine ever invented. It means something to the sheep raiser to send his herd to market free from ugly wounds or scars which are sure to reduce the selling value of his animals. It means still more to him to turn his sheep on the range free from open sores caused by cutting when shearing, sores which become infected from poisonous

weeds and insects and which frequently introduce disease which sweeps away whole herds of valuable animals.

NO MATTER IF YOU HAVE TRIED OTHER MACHINES,

which have proved utter failures and which you have given up MARTIN at our expense. No sheep shearing machine on the market can compare with the Martin. We challenge the maker of any other machine on any and all good features. Order any other machine, if you like, and compare it with ours. Try them both. See which runs easier, requires the least power to operate, clips closer; see which one clogs or sticks when shearing thick or matted wool, note carefully the materials and workmanship, and if your judgment on every point is not entirely in our favor, send our machine back at our expense and we will return your money.

YOU CAN'T CLOG THE MARTIN,

no matter how thick the wool or how fast you shear. It cuts faster than you can handle the sheep. It is the only machine which will clip the wool from every part of the animal, from the legs, from around the ears, etc. It shears over the abdomen without the slightest danger of injury to the sheep. You don't have to use the hand shears to start the shearing nor to finish up on the job, as you have to do when you use any other shearing machine on the market. If the wool on the bricket is matted the Martin cutting head will eat its way under it, and do it easily and without extra exertion. No other machine will do this. The user of any other machine is compelled to use the hand shears from a third to half the time, but the user of the MARTIN can throw away his shears, as he will never have further use for them.

IT DOES NOT MATTER

whether you have ever used a shearing machine or not, you can learn to operate the MARTIN quickly and do perfect work with it. We send a book of instructions with every machine we sell, showing in both pictures and descriptive matter the various steps in shearing from the time the sheep is taken in hand until the fleece is entirely removed. It is all very easy. By the time you have had the practice which comes from shearing a half dozen sheep you will be able to do as perfect work, you will be able to clip as closely and as thoroughly as the most expert workman and speed will come to you as you become more experienced. Therefore, do not hesitate to order this machine. You will not have the slightest trouble in operating it, in doing perfect work with it, as it is so simply constructed and has absolutely nothing to get out of order.

OUR FREE TRIAL OFFER AND REFUND PROPOSITION. SEND US AN ORDER FOR THIS PERFECT SHEEP SHEARING MACHINE

at our price, \$11.95. When it reaches you read our instruction book containing very full and very plain information, oil all the bearings and shear 50 sheep with it. We want you to use it in your own way, give it every trial you want to give it, and decide for yourself the merits of this machine. If you do not find that it does all we claim for it, if you are not satisfied after having taken the fleece from 50 sheep that this machine is a great economizer of time, that it will get more wool from every sheep than any other method of shearing will secure from it, if you do not feel that it is a wonderfully profitable investment for you and in every way a perfectly satisfactory shearing device, you may return it to us at our expense of transportation charges both ways and we will promptly refund your money.

OUR BINDING GUARANTEE.

WE BUILD THIS MARTIN

Sheep Shearing Machine in our own factory under our own supervision and as we put into it the finest materials obtainable, all the steel we use is specially hardened and tempered for our use, and as we employ the most skilled workmen in its construction, we give with every machine we sell a binding guarantee that if at any time within 20 years any piece or part gives out or breaks by reason of defective material or workmanship we will promptly replace such defective piece or part absolutely free of charge. This guarantee does not apply to comb or cutter, minor parts which are sometimes broken by careless handling and dropping on the floor. We guarantee the Martin Sheep Shearing Machine to be better made, to be longer lived, to be more durable, faster, easier to operate, simpler, stronger and to clip closer than any other shearing machine ever invented and in offering it to you we send it out under the strongest, most binding guarantee offered by any manufacturer or dealer.

EXTRA PROFITS ON 200 HEAD OF SHEEP.

THIS IS WHAT THE MARTIN will do for you if you have a herd of 200 sheep, basing the figures on the most conservative estimates. 150 pounds extra wool at 25 cents per pound... \$37.50
Cost of shearing, \$6.67 instead of \$30.00, saving..... 23.33
Additional profits..... \$60.83
Add to this the increased price your wool will bring because of better quality, add saving in board of sheep shearers for days and weeks at a time, and you will find that your sheep will yield you from 60 to 75 cents a head more than they did before you used the Martin.

DESCRIPTION OF THE MARTIN MACHINE.

THE FRAME is made of the best gray iron and is very substantially constructed. It is of graceful design and very strong, and is well painted to preserve it from rust. **THE BEARINGS** are of the very best cold rolled steel, case hardened; they are accurately milled and properly equipped with oil holes. **THE COMBINATION BALANCE AND DRIVE WHEEL** weighs 20 pounds and is accurately turned on a lathe to insure its running true. **SMALL GEARS** are made of the very best cold rolled steel, case hardened. **SHAFT** is of cold rolled steel made especially for use in these machines. **CASING** is of best cold rolled drawn steel tubing. **ALL GEARS** are carefully protected at the knuckle joints so that the operator cannot get his clothing or fingers caught in the mesh. **THE HEAD** is the most important part of the machine and the illustration herewith shows the general style of construction. The comb is carefully milled; it carries nine teeth and is adjustable to the cutter knife. The teeth are open and short and readily enter the wool and absolutely will not clog. It does not require hard pushing, just the gentlest pressure, just enough to keep the teeth against the uncut wool will keep it moving rapidly. The cutting blade which vibrates back and forth upon the teeth of the comb, is speeded to about 1600 vibrations per minute and it possesses a cutting power exceeding any other cutting head ever devised. It cuts so rapidly that there is no limit to the amount of shearing it will do, the speed depending altogether upon the ability of the operator to handle the sheep. Because



\$12.95

Is our price for this wonderful sheep shearing machine, complete with stand exactly as shown in this illustration.

of the short, blunt comb and protected cutting knife it is absolutely impossible to cut the sheep by accident. The cutter lever is made of manganese bronze, it is hung on perfect bearings and it will last forever. The comb knives are made of a special high grade cold rolled tool steel, specially hardened and tempered for use in these machines. One knife will shear from 20 to 50 sheep, depending on the condition of the wool; if it is free from sand and dirt it will be no trouble at all to shear 50 head with one knife. A small thumbscrew on the cutter lever regulates the tension on the cutting knife and as the blade grows dull a slight turn of the screw presents a new cutting surface. This cutting head has an absolute shear cut and does not grind off the wool as other machines do, but cuts it clean and smooth and does not pull. The dull cutter blades are quickly removed and sharpened blades inserted. All the working parts are made of the best cold rolled steel, case hardened and are enclosed in a malleable cast handle heavily nickel plated.

SPECIAL NOTICE—We will exchange one sharp blade for every two dull cutting blades sent us, or we will sharpen dull cutting blades free of charge, providing you pay postage



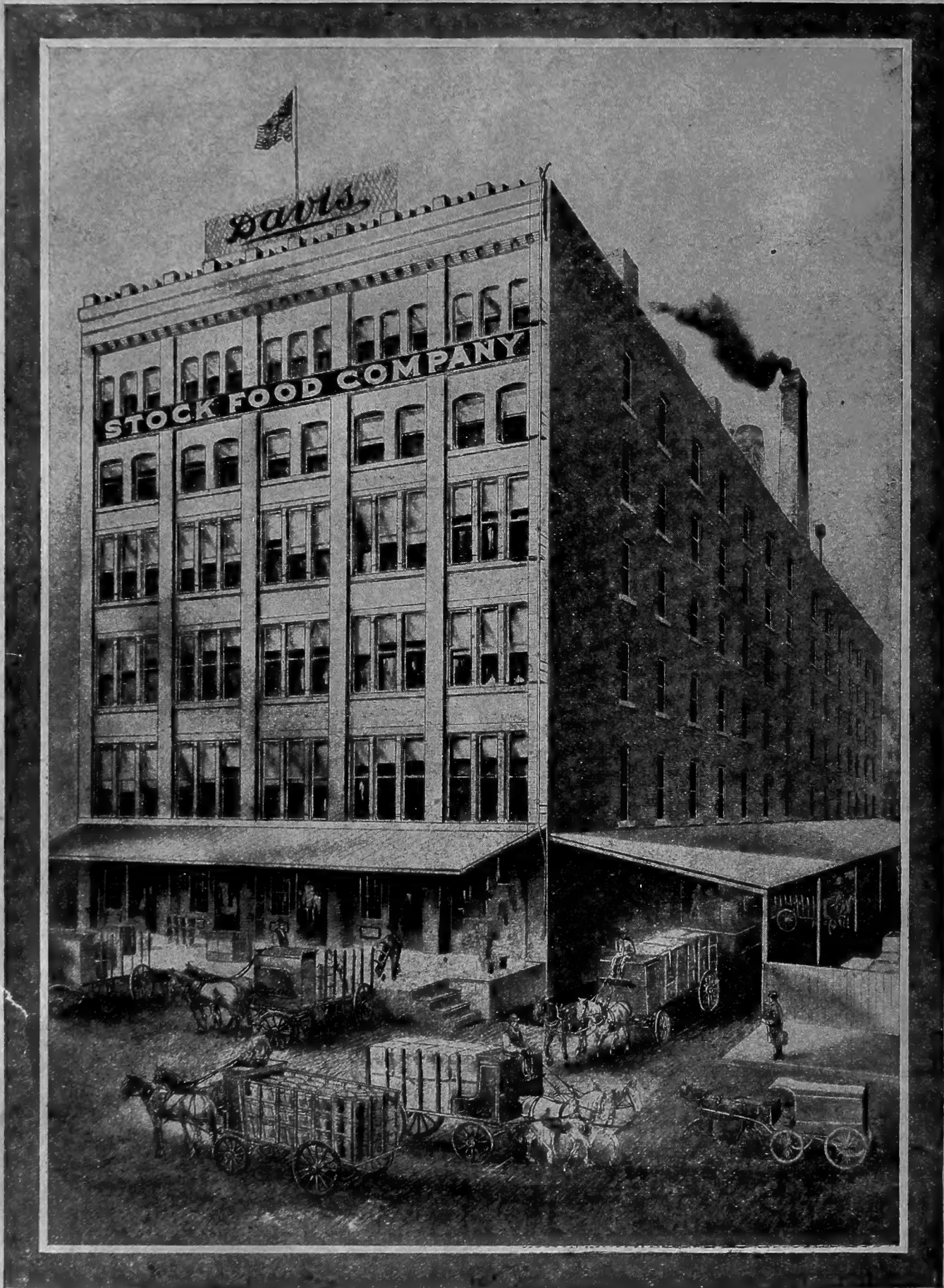
This cutting head is simple, with no complicated parts. All bearings are carefully fitted, the cutting knife is instantly adjusted by means of thumb-screw and comb is adjustable. Note open comb teeth, only two cutting teeth, length of handle, etc.

THE HEAD.

ESPECIALLY for those who are raising sheep in sections of the country where the weather becomes very warm and where it is desirable to leave longer stubble on the back as a protection against the sun, we equip the cutter head with a special comb guard, by the use of which the length of stubble may be easily regulated. For price of this attachment see price list below.

No. 10G4855 Martin Sheep Shearing Machine, ready to fasten to post or board. Complete with four cutting blades. Price.....	\$11.95
No. 10G4856 Martin Sheep Shearing Machine. Complete with iron stand and four cutter blades. Price.....	12.95
Extra Cutting Blades. Each.....	\$0.50
Extra Combs. Each.....	1.00
Comb Guard, for regulating length of stubble to protect back of sheep from sun.....	1.00

Address all orders to **SEARS, ROEBUCK & CO., CHICAGO, ILL.**



FACTORY OF THE
DAVIS STOCK FOOD CO.,
CHICAGO, ILLINOIS.
CAPACITY 30,000,000 POUNDS A YEAR.

One Thousand Pointers

FOR

Stock Raisers

A TREATISE ON

Twentieth Century Methods of Breeding and Feeding Live Stock

Including a Digest of Government and Private
Feeding Trials for the Past Two Decades;
an Exhaustive Treatise on Diseases of all
Live Stock, With a Chapter Devoted
Entirely to the
Truth on Stock Foods



ILLUSTRATIONS OF THE WORLD'S MOST FAMOUS ANIMALS,
ALSO PLANS AND SPECIFICATIONS FOR FARM BUILDINGS, Etc.

BY

H. O. DAVIS, M. D. V.

PUBLISHED BY

DAVIS STOCK FOOD COMPANY,
CHICAGO

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INTRODUCTORY.

There has been a long established need of an exhaustive and comprehensive work on the general breeding and feeding of live stock together with a common sense treatise on diseases, couched in language and terms that the farmer could readily understand. True, a great many books have been published, and the author is indebted to many of them, which have been used as a reference in the compilation of this book. But it is also a fact that a few or none of them have hit the mark. By that we mean that one book was perhaps exhaustive in its especial line, but treated the subject too scientifically for the layman to fully grasp. On the other hand, another book, while couched in terms and language which the layman could understand, did not treat the subject exhaustively—and it was the need of such a work that first suggested this book.

On the other hand, as the American farmer knows, there are numerous stock food companies in existence that have attempted to advance the welfare of their goods by publishing a so called stock book, which was advertised in glowing terms, and its value to the farmer greatly exaggerated, for, in the main, they one and all contained glowing accounts of the enormous value of a certain stock food, the remaining space occupied by numerous testimonials. It was this condition of affairs more than anything else that first made us hesitate in offering this work in connection with Davis Stock Food, but we finally decided to issue the work, knowing that the American stockman was fair minded and appreciative enough to recognize value.

The enormous cost of this work and the publishing of this book, together with the infinite care and research necessary, would have made its production prohibitive unless we could, in a measure, have charged part of its cost on our advertising appropriation. With this idea in view, we have taken up all the feeding problems that the American stockman will meet. They have been discussed exhaustively. Government statistics, not only of this country, but of foreign countries, have been searched for data that would be of value to the American stock raiser. We have not thrust Davis Stock Food forward promiscuously through the book, but only in such cases where it will prove of invaluable assistance, and where we are willing to stand back of it in every sense of the word. In the treatment of disease we have not followed the steps of other stock food companies and simply told you that such and such a proprietary remedy was the only recognized cure. Instead of that, wishing to make the book valuable to all stock raisers, whether or not they patronize the Davis Stock Food Company, we have not only given good common sense home treatments, but we have given prescriptions that your home druggist can fill—and they will, one and all, be found reliable. We have, of course, told you those remedies manufactured by the Davis Stock Food Company that are applicable in the various diseases. We feel that we are thoroughly conversant with the live stock industry, and that the remedies that we are preparing cannot be improved upon for their various uses. We also know that they are offered at prices much less than the American farmer could secure them for were he to have them made up on a prescription.

Knowing the full value that we are giving in our preparations, we have made a radical departure from the methods followed by our competitors. We feel that, when the American farmer pays out his good money for an article, he is entitled to know just what he is buying, he is entitled to know whether or not the article is of any medicinal value, he is entitled to know that it contains no deleterious or useless drugs, and we have, therefore, published in plain letters the contents of our packages, so that every person may know the composition; and we can say to you in all honesty that the various remedies that we are manufacturing are without question the best that we have been able to manufacture. Their formulae are without question the best that Twentieth Century medical science can produce. Extensive and thorough tests have demonstrated their worth, and, even though you do not care to purchase these remedies from us, you can do no better than go to your local druggist and have him mix the remedies for you and furnish you with the article.

Of Davis Stock Food we have much to say in this work—much to say because we believe it worthy of the space it occupies. If you have used good stock foods before, you know how valuable an adjunct they are in the proper care of domestic animals. If you have been so unfortunate as to have been swindled by the purchase of some of the numerous preparations on the market under the guise of stock foods, we ask you in all fairness not to condemn Davis Stock Food with them. We print the ingredients of Davis Stock Food in plain letters on the label of every package. In the back of this book we give verbatim descriptions of each of the drugs used, taken from the United States Dispensatory (an official publication of the United States Government). By perusing this chapter on stock foods you do not have to take our word for what Davis Stock Food is. Take the word of the United States Government and the expert knowledge of the world on it. All we ask is a fair and impartial judgment. We expect to give a square deal, and ask a square deal in return.

The Davis Stock Food Company is in existence not only for a day, or a year, but we hope for all time to come. We honestly think that Davis Stock Food has an important mission in the live stock industry of this country in the coming years. Science is advancing in all lines. The world is moving rapidly. Improvements are matters of every day occurrence, and we shall do our best to keep pace with them. Above all, we wish the respect and confidence of the American farmer. Whether he purchases Davis Stock Food or Davis Veterinary Remedies or not, we want him to feel that we are just as much interested in his stock as he is himself, because the welfare of his stock is in common with the welfare of the live stock industry of this broad land. If at any time, under any conditions, there is any information that he thinks we can supply him with, we shall be only too happy to have him write us fully, and our organization is at his disposal.

We have devoted several chapters in this book to common sense plans for farm buildings, such as suggested by the United States Government bulletins issued by the Department of Agriculture. We have given specific and full information not only on the ordinary farm buildings, but for the building of dipping vats, and the equipment of poultry farms. We shall be happy to furnish any additional information that our readers may wish.

In conclusion we would ask you to thoroughly investigate this work. Keep it handy, where it can always be referred to. We are confident it will save you many a dollar; and, if you are convinced of the value of this work, of our honesty of purpose, of our ability, and of our knowledge of the live stock industry, credit it to our account and grant us the privilege of a thorough trial of Davis Stock Food.

Believe us, that Davis Stock Food, as a stock food, is as far ahead of any other stock food on the market as this book is ahead of other publications available to the farmer. As new discoveries and advancements are made in science, applying to the live stock industry, we will attempt to keep abreast of them. This book will be revised with each subsequent edition, and kept up to date in every particular. It is published in two styles of binding: the paper cover edition, at 50 cents a copy, and the heavy paper, cloth bound edition, at \$3.00 a copy.

We hope to play a memorable part in the future live stock industry of America; and the day is not far distant when the live stock industry of America will control the live stock business of the world. Even now we are exporting breeding animals to the four corners of the globe, where but a decade ago we were importing. The wealth of the United States depends upon the American farmer, his efforts, his ingenuity, and his toil. He has made America the admiration of the world; and American live stock, through his efforts, is the best in the world. We are proud that we are identified with it. We shall be more than glad if we can assist in its future development.

DAVIS STOCK FOOD COMPANY

LIVE STOCK—PAST AND PRESENT.

The condition under which all domestic animals are kept, while having improved a thousandfold, even in the past twenty-five years, is still far from the ideal, and is, in a great measure, responsible for the millions of dollars that are lost every year by the stock raisers of the United States. There are many stockmen who have given the matter thorough attention, and who are so fixed financially that they are now caring for and housing their stock in almost an ideal manner. But where one such man is found we find a thousand who, through perhaps no fault of their own, are unable to do likewise. On the other hand, the average stock raiser, it is safe to say, has never given the care of his animals adequate thought. Let us go back into the dim past, necessary in the consideration of the conditions in which animals found themselves in those days. The horse, wild and untamed, roamed the ranges and the forests at will, seeking the milder climates when winter's blasts swept over the country, endowed by nature with the instinct of self preservation and, in addition, with that intangible "sixth sense," telling him what and what not was the best for him to eat. These conditions produced a particularly rugged constitution, peculiarly well fitted to battle with the elements.

The ox in primeval times little resembled the high class animal we have today. In the hog we have, perhaps, the most radical change. Its ancestor—and not very many decades ago at that—was an exaggerated form of what we call the razorback today. He had no one to carry him corn and slops; instead, he was compelled to wander many miles. His snout, by necessity, grew to an unusual length. His feet were sharp and strong to provide him with a weapon against attack, and also assist him in digging the various roots, barks and herbs (nature's stock food) out of the ground that he needed to keep his system in good, healthy condition.

Today all this is changed. The horse has been deprived of his freedom, brought to the cities and compelled to walk on roughly paved streets. His feet, by nature not intended for such contact, have been encased in steel, harness has been fitted to him, and after the day's labor he is compelled to stand in a narrow stall, tied by the head, deprived of the green, succulent grasses and the exercises which nature, in her wisdom, found necessary for him. While this is true of the city horse, it is also true, in a measure, of the horse of the farm, though not to so great an extent. All this the breeder must take into consideration. In supplying the cities he must, for instance, breed a horse of muscle, a horse that is hardy, that has strong legs and strong feet to meet the latter day conditions. Even his own horse, on the farm or ranch, while under radically different conditions from those which the Creator intended him to occupy, is unable to provide himself with the remedies that nature formerly gave him. The instinctive selection of the various roots, herbs, barks, etc., has been bred out, and he is deprived of it. He, therefore, is as helpless as a new born babe when his body suffers from disease.

The modern dairy cow and beef animal is under even greater disadvantage than the horse. Developed on two distinctly different lines, finely bred, they must by necessity have special care, and not every farmer is equipped to give them the care that they should have. In the dairy herd, where the sole idea is milk and butter fats, all the care and feeding must be with that idea in mind, taking no notice of the beef qualities other than to eradicate them as much as possible. In attaining these ends it is a curious fact, with which all dairymen are familiar, that the constitution of the modern dairy cow is materially weakened, and of all domestic animals they are probably the ones that are most in need of special care. The modern beef cattle have not lost, but if anything, have gained constitutionally. They have been developed into a wonderfully perfect machine for the production of beef, and with them our problem is, while preventing disease, to produce the maximum amount of beef at a minimum cost.

The American hog has set the pace for the world, and there is little resemblance between the finely bred pork machine of today and the razorback of yesterday. In the process of development his system, however, has also suffered, but more than anything else has he suffered from neglect. The farmer, who would no more think of neglecting his horse or his cow than his own household, will pick out the filthiest

mud hole on his farm, usually behind the barn, for the hog pen, and give the helpless hog the manure pile for a home. He is fed the refuse of the house, moldy corn, etc., in fact, almost everything conceivable that the other stock will not eat. Under these circumstances it is strange, indeed, that the American hog has given such an excellent account of himself in the markets of the world.

Dishonest Stock Foods.

It was because of the foregoing conditions that stock foods first came into existence. They proved of material benefit in the old world, where they were first introduced and adopted, and they have since been used continuously. Like everything else, however, their reputation had to suffer because of numerous cheap preparations put up under the guise of stock foods. They were one and all recommended to the farmer to do wondrous things. This one would cure diseases in each and every form, the next one would grow a mature animal in an incredible time; another—if you were to take the advertisement at its word—would enable you to raise stock without feed. Some, again, would lead to the belief that the mother would bear many fold if but their stock foods were used. All this, of course, has proved very injurious to the legitimate stock food business, but the American stock breeder of today is broad minded enough, and has discretion enough, not to censure the good with the bad.

Davis Stock Food is not a cure-all. It will not cure lock jaw or lung fever, neither will it cure hog cholera or lump jaw, and we are sure that it will prove of little benefit in a case of lameness. It is, first of all, a tonic, a digestive, a blood purifier and an intestinal antiseptic. It will help you to decrease your feed bills by increasing the flow of gastric juice in the stomach and intestines, and thus digest the feed that the animal eats in a more thorough manner, giving it more nutriment from the same feed or same amount of grain. It tones up the system and increases the appetite, something that is very important, as all feeders know. It is an antiseptic in the alimentary canal, absorbing foul gases and destroying dangerous disease germs. It is absorbed by the system, enters the blood, purifies it and is discharged through the skin and kidneys. But once disease enters the system—which it will even in the healthiest of animals, and under the most ideal conditions—we do not recommend you to depend upon Davis Stock Food alone for a cure. It is true that the best treatment of disease is its prevention, and the healthy animal, whose blood is pure and whose system is in good condition, is much less liable to be affected with disease than the one that is run down and in bad condition physically.

We have in this book attempted to explain in every day language all the most common diseases of live stock, telling you their cause, their symptoms, and the most rational treatment for them. In the great majority of cases we manufacture remedies especially suited for the case. They are prepared in a scientific manner in our laboratories, under the eyes of trained chemists, and only absolutely pure drugs are used in their preparation. Buying, as we do, all drugs in car loads, we are enabled to purchase them for much less money than the small druggist, but, while we would like to see every stockman use Davis Stock Food Preparations, there are some who probably will not, others who, while in favor of them, do not happen to have the right one at hand at the time when it is needed, and still others will depend upon a veterinarian entirely. No matter to which of these classes you belong, we want you to have this book, and we therein not only tell you which one of our preparations is best suited for the particular disease, but we also give you good, common sense, every day treatments, to be used in emergencies, before the veterinarian can reach you, and treatments that will in a great many cases effect a cure, if properly applied.



GENERAL ADVICE.

The conditions and surroundings of live stock today are largely created by man and are, to a greater or lesser extent, under his control. They may be conducive to good health and utility of animals, or, if these are neglected or improperly attended to, they may prove highly injurious, and are, not infrequently, the active cause in the production of disease. The greatest inroads of mortality among live stock is usually seen in crowded districts, or where animals are gathered in large numbers. The old adage, that "An ounce of prevention is better than a pound of cure," was never more applicable than in the live stock industry, for it is certainly much easier and more economical to prevent disease than to cure it. The stockman who understands this, and exercises his judgment accordingly, is usually well repaid for the trouble.

In considering the general care of live stock, their quarters should be the first thing to receive attention. They should be such as to protect the animals from the inclement winters and spring rains, and at the same time provide shelter from the heat, flies and insects of summer. They should be light, dry and well ventilated. There is no greater foe of disease than plenty of sunlight and good pure air; sewerage, also, should be properly taken care of, and cleanliness is a matter of necessity. The manure pit should be removed from the barn, and not placed where every zephyr that blows will waft the foul odors and disease producing germs into the quarters of the stock.

In a great many modern stables kindness has gone to extremes and produced barns and buildings that are so warm as to make them not only uncomfortable but a direct cause of ill health. On the other hand, the average building for live stock is just the reverse, and is full of drafts, chilly and cold. The ideal temperature for a stable in winter is, approximately, 50 degrees Fahrenheit, and the animal heat, when the stock is housed, will increase this materially.

Another mistake, and a very common one in the housing of animals, is that of too much crowding. Every stockman will find it economical to provide sufficient room, so that all his animals can be comfortably housed, with sufficient space to move around in to insure pure air. Ninety square feet of floor space for each animal is a fair allowance. The stables should be cleaned every day instead of leaving it, as many do, for a rainy day's job.

Feeding and Watering.

We think we are safe in saying that more animals suffer from overfeeding than lack of feed, an especially hard condition to combat. The stockman who is in love with his work and with his animals is always liberal in his feeding and often gives them more than is good for them, in mistaken kindness. While a great many—in fact, we might safely say, the great majority of stockmen and farmers—who have no especial knowledge or information on the subject, are unaware of the exact amount an animal should have in order to maintain it in a healthy condition. The subsequent pages are mainly devoted to giving such rules for feeding as will serve as a guide to the breeder.

Feeding.

In feeding cattle, sheep and hogs, which are necessarily fed in bunches, care should be taken that animals of equal strength and vigor are placed together. The weaker ones should be given separate quarters, so that, when the feed trough is filled, all can get their share. It is a common thing to see a feed trough from which the smaller and weaker ones of the animals are forced away, while the stronger brethren get the lion's share. Too great a number should not be fed from any one trough. In feeding hogs for fattening, for instance, it is not advisable to have more than ten in a pen. This will be found much more economical and greater gains be made from the same amount of feed. The same rule will apply to cattle.

Watering.

Too much emphasis cannot be placed upon the necessity of always having at hand a plentiful supply of good, fresh water in the feeding of all animals. Too often the hog is expected to drink from the same mud hole in which he wallows. Cattle, horses, in fact, stock of all kinds, are often compelled to go to running streams, which is, we will admit, handy, and in a great majority of cases good, but if the farmer would protect himself absolutely, he would water his stock on the streams that originate on his own land. The creek that originates fifteen or twenty miles up the country is very liable to carry disease into your herd. Should there be hog cholera up above on the stream, your hogs would become infected. It is thus disease is spread. So, by all means, if possible, water your stock with water that originates on your own farm.

Stock of all kinds should always be watered before feeding, never after, and in winter the chill should be removed, if possible. Drinking to excess of ice cold water has caused many deaths and a large loss in the live stock industry.

Exercise.

It is very important that sufficient exercise be provided to maintain the general health and vigor of all animals. Horses that are working steadily are, of course, provided with sufficient exercise, but if possible, once a week at least, they should be given the run of a good barn yard or lot and allowed their freedom. Milch cows are too often confined in the stable or a very small lot the year around. We cannot too strongly condemn the practice of keeping them in the stable too long at a time, and it will be found economical to provide a good sized exercise lot, where they can be given their freedom every day the weather permits. It will not only improve the quantity but also the quality of their milk and keep the animals in a much healthier condition. It is especially important that all breeding stock have sufficient room to exercise at will, if vigorous, healthy young animals are to result. The average stockman probably appreciates the necessity of penning feeding animals up for the latter part of the feeding period, for there is no economy in allowing such animals to run off a great percentage of the fat that they had succeeded in putting on.

Protection.

The average animal on a farm is fairly well protected against all kinds of weather if good stables are provided, but if it is necessary to expose them to inclement weather or cold, drizzling rains, they should be provided with good warm blankets, securely fastened. In the seasons when flies, insects and mosquitos abound, stockmen will find it economical to use some of the various preparations on the market, such as Davis Fly Chaser, that have been found to possess undoubted merit in keeping such insects away. Especially is this true of the fattening animals and the dairy cows, as they not only act as an irritant and source of annoyance, but are a source of loss in nerve energy, and oftentimes an animal will consume all the feed it eats in fighting away these pests. In such cases a good fly chaser is of untold benefit, and the humane stockman will keep it at hand at such seasons.

In another part of this book we have reproduced several illustrations of barns that have proved very satisfactory. They are not elaborate nor expensive, and are within the reach of all stock breeders; no matter how slim may be their purse. We have also given floor plans and such measurements as are necessary to convey a clear understanding of the subject.

There are some points in the arrangement of your barns and stables, however, that it will be well to take into consideration. Always provide for adequate sewerage; if possible, face your stables south and east, with plenty of lights, so that the sunlight may stream in. Arrange them so that they may be easily cleaned and the manure easily carried away. Also build them in such a location that they will not get the drainage of the surrounding land, and do not place your barn on the side hill, where the drainage from it will run down directly into the creek from which your stock must get their water.

The walls should be so placed that the light is admitted from the rear, thus protecting the horses' eyes, and at the same time providing better ventilation in the stalls. The feed boxes should be so arranged for the horses that they can easily be cleaned, and in such a manner that each horse can eat from his own box only. The edge of the box and manger should be protected with strips of iron to prevent them from gnawing it, and thus contracting the habit. The bottom of the manger, in which the hay is kept, should be slatted or open, so that dirt and dust will not accumulate.

It will be found to keep the interior of the stable whitewashed. A machine can be bought for this purpose, making the task not at all disagreeable, and an extremely short one, and the good gained more than repays the little time and money it costs.

Care of the Skin.

In dairy cows and horses grooming is essential, if the best results are to be obtained. An every day grooming with a good, stiff brush for the horse is well worth all the time and trouble it takes. In cows it is a matter of necessity, if cleanliness is to be observed. The hind quarters around the udders of the dairy cows should be kept free from long hairs, and in all up to date dairies a regular clipping with a clipping machine is adopted. Horses with long, thick coats should by all means be clipped, as they sweat easily, and the long hair will hold the moisture, so that the animal is more than likely to take cold if compelled to stand still after exertion. Clipping twice a year will keep an ordinary horse in good condition—once in the fall and once in the spring. This allows them to accustom themselves to the severe changes of winter; the spring clipping removes the winter coat before the hot weather sets in. Horses, however, that cannot be protected from the cold by warm stables, should not be clipped in the fall, except on the legs. This is very important, if diseases of the feet and hoofs are to be avoided, as the long hair accumulates dirt and mud, this causing irritation and inflammation of the members. Good, clean bedding should be supplied at all times and the foul bedding removed every day. Sawdust or shavings are most desirable as a bedding, as they absorb moisture.



THE CARE OF THE SWINE.

The hog is probably the most abused animal and the least cared for among American farmers today. It is not caused by intent or purpose, but rather is due to thoughtlessness and following the practice handed down to us by our forefathers. Give the American hog fair treatment and his share of good, clean, wholesome feed and there is no better paying investment on earth. When one stops to consider the conditions it is, indeed, marvelous that the American hog has made such a record for himself under such adverse conditions. Even on the average farm, where there is an abundance of pasture and green stuff growing, it is too often the case that the farmer never thinks of giving his hogs the benefit of it. Instead of confining them to close quarters and keeping them there until their lot becomes filthy and unfit for use, it will be found economy to provide plenty of good, green pasture for the swine.

Give your breeding sows but little corn, the less the better. Instead, provide them with a good protein ration; give them plenty of green, succulent feed, with a good supply of pure water to drink. They will then amply repay you by raising such pigs as you never dreamed of before. Pigs should not, as a rule, be allowed to suckle their mothers more than six weeks; if they have access to green stuff and other green feed, it will be found that they will be eating and almost supporting themselves by that time. In fact, it should be the main business of the herdsman to see that the young pigs are made acquainted with grain, and are eating everything in this line before they are weaned, so that there will be no setback when they are taken from the mother's milk. The carpenter builds and erects the frames of his building, first building it and later adding the roof and finishing touches. It will be well for the farmer to do likewise in raising his pork. The average farmer feeds to excess, and consequently has nice, fat, sleek looking pigs, which are very nice to look at and pleasing to the average eye, but far from profitable when looked at through the bottom of the pocketbook. They are much more susceptible to disease, and never develop the bone necessary to carry their weight. Instead of this, the sows and pigs should be fed on a high protein ration and given plenty of exercise. The pigs, after weaning, should be sustained upon the same ration, and have at least a ten-acre lot to run in. They should be kept on this until four months old or possibly five, by which time they will have attained a good frame and will be in prime condition to take on flesh for the market. They will also be healthy, and usually have ravenous appetites. At this time they should be separated according to their size, and the pigs intended for the market placed in lots for feeding. We do not advise over ten pigs to the lot, and the lot should not exceed in size over 400 square feet. It should be supplied with plenty of good, pure drinking water, and running water should be in front of them at all times, if possible. They should be provided with good, warm, dry sleeping quarters, and a good, clean floor and troughs for feeding. It is at this time that corn has proved itself the premier fattening feed, all things taken into consideration. The pigs should be gradually brought up to the full quantity of feed necessary. Green stuff should be fed them every day if possible. If this is inconvenient, at least once a week—but preferably once a day—give them a good mash; this, as a variety from the other feed, keeping them from getting stale.

It is just at this stage that Davis Stock Food will show most gratifying results. A tablespoonful for every 500 pounds live weight, mixed with the feed, will increase the appetite, materially assist the digestion, keep the bowels open and decrease the fattening period by at least 20 per cent. With the proper care and constant use of Davis Stock Food, hogs at this time should gain from two to three pounds a day.

Feeding.

The problem of feeds and feeding is one in which we are all interested, and it behooves the stockman of today to give careful attention and a thorough study to the subject—no matter what class of live stock is being raised, or for what purpose. There are always certain feeds in the way of grains and grasses that apply to each individual case. The dairy cow would be of but little use, and give but small returns, were she fed on a beef ration, and it would take us a long time to fill the lard barrel comfortably if we were feeding for bacon

with lean producing foods. The United States government and numerous individual stockmen, who had the necessary facilities, have spent much time and money in researches to perfect and bring to our knowledge the uses and abuses of the various feedstuffs, and the profitable feeding of animals. They have reduced this to a science, and a profitable one at that. They also have been instrumental in giving us the special purposes of the various animals in more definite form. No stockman would now think of going into the dairy business with Hereford cattle, and his neighbor would scarcely start a herd of Jerseys for beef production. At the same time all stock raisers know that—or should know—taking the same animal, surprising results can be obtained by the judicious use of the proper feeds, while improper feeding can make almost any animal an unprofitable investment.

It is essential that the stockman should become acquainted with the principles of digestion and the constituents of the various feedstuffs, so that he may know how to best attain his ends. He should also become familiar with some of the terms that are now in common use.

From time immemorial grazing was the chief dependence for securing the production of meat and milk, and the maintaining of our animals. It is within the recollection of many men now living that live stock was expected to do little more than maintain the body during the cold or winter months. At that time the demands of the market were much simpler than at present and our population infinitely less. The past four or five decades, however, have seen more or less changes and especially the past twenty-five years. To apply the name dairy cow, as now used, to an animal twenty-five years ago, would have been considered absurd by modern dairymen, for the ideal dairy cow of today is a machine run under high pressure continuously for the production of milk, which milk must be rich in the several elements for which it is intended, that is, butter fats or cheese. The successful dairyman of today must understand the care of his animals thoroughly. He must provide proper winter quarters for his herd, and throughout the entire year, from month to month, provide such a ration as will make his cow capable of meeting the demands of the market. He must now buy various kinds of the commercial feedstuffs, carrying a certain percentage of the various constituents that are necessary to produce the class of milk that his business demands, and the more up to date dairyman does not stop here; he also resorts to additional other methods that will assist him in obtaining the maximum amount of nutriment from the grain fed. We ask you, Mr. Stockman, if it is not poor economy for you to pay from \$25.00 to \$30.00 a ton for feedstuff that is but 50 per cent digestible, when it is possible to increase the digestibility 20 per cent without any material increase in cost? Under ordinary circumstances you obtain 1,000 pounds of actual nutriment from every ton of feed. By the addition of such an article as Davis Stock Food, its digestibility is increased until you can obtain 1,200 to 1,400 pounds actual nutriment from each ton. You are therefore obtaining from 200 to 400 pounds more feed for the same money; certainly good business in itself, in addition to the fact that you are keeping your cow in better condition.

The numerous and exacting demands of the public today, and consequently of the market, have forced the stockman and farmer into a new range of thought and practice. They have compelled them to meet these conditions, and deliver lean bacon or fat bacon, milk rich in butter fats or carrying a medium amount of butter fats and the production of quantity, the chief end.

To attain all these ends involves many difficult questions. It means that the science of farming must be thoroughly equipped with the production of forage and grain crops peculiar to each man's business. The demand must be supplied, and once supplied, used to the best advantage, wasting nothing. With all these considerations in view, the farmer must understand the question of what feedstuffs he can raise most economically, and what he must produce.

FEEDSTUFFS.

To start at the very beginning—plant life is the foundation of all animal life. In some manner, to a great extent inexplicable to us, the farmer carries to his fields and plants a few seeds, and, with the proper care and attention, he carries back from those same fields a thousandfold—mother earth having matured the seeds he planted, and gathered from—we know not where—the innumerable constituents necessary for its production.

In feeding the grains and grasses to our live stock, the second period in our operations commences. We may take grasses or grains and burn them, and we obtain nothing but heat; we feed them to our animals, and they not only support the bone and muscle and furnish the nerve force, but supply to the animals the same amount of heat that we obtain by burning the grain. For, no matter how cold the weather, the normal temperature of the animal's body remains the same. In the first instance the plant is wholly burned up, except the mineral portion of it, while all those elements that go to produce heat, muscle and energy, when used in the animal body, escape in the form of various gases.

To give the stockman some idea of the various constituents of feedstuffs in the animal body, it has been estimated by Knop, a German scientist, that if all species of the vegetable kingdom were collected into one great mass, the ultimate composition of all the dry matter resulting from this mixture would be as follows:

	Per Cent
Carbon	45
Oxygen	42
Hydrogen	6.5
Nitrogen	1.5
Mineral compounds (ash).....	5

This is, of course, a general average. On another page of this book we present a complete list of all feedstuffs, giving the average analysis of each, showing the farmer just the amount of carbohydrates, protein, fat, and ash in the various feedstuffs.

Lawes and Gilbert of England, also the Maine Experiment Station in this country, have made analyses of the entire bodies of steers and domestic animals. These results, combined with our knowledge of the constitution of the animal tissues, enable us to calculate very closely the proportion of carbon and other elements in the entire body of the ox, which are as follows:

CONSTITUENTS	Fat Ox Lawes and Gilbert Per Cent	Two Steers, 2 years old. Maine Station Per Cent
Carbon.....	63	60
Oxygen	13.8	14.1
Hydrogen	9.4	9
Nitrogen	5	5.8
Mineral compounds (ash).....	8.8	11.1

From the figures already given it is easily seen that animals like plants consist of carbon in greater proportion than that of any other element, and that the quantities of other elements stand in approximately the same order in the animal as they do in the plant, the most striking difference being that there is a greater proportion of oxygen in the plant and a much higher proportion of carbon and hydrogen in the ox.

Carbon, oxygen and hydrogen constitute approximately 85 per cent of the bodies of fat oxen and steers.

In raising grain, grasses or forage crops for animals it is well for the farmer to know at what season of the year it is the most profitable time for harvesting it, and there is a much wider difference in the nutritive qualities of hay cut at various times than the ordinary stockman appreciates. For instance, timothy hay, cut as per the following table:

Timothy	Maine State College Percentage of Water
Nearly headed out	78.7
In full blossom	71.9
Out of bloom	65.2
Nearly ripe	63.3

This explains several things. It tells us first why it is difficult for us to cure early cut grasses. The facts, as shown by above table, that are true of timothy, are true of practically every species of grain forage, and when the farmer or stockman is soiling his crops, it is well for him to bear it in mind. As the greater percentage of grasses and forage plants are composed of water, so is the animal body, which is shown by the following table, which means that the percentage shown is the amount of the entire body consisting of water at the time of the analysis:

	Water in Entire Body, Per Cent
Ox, well fed, Lawes & Gilbert	66.2
Ox, half fat, Lawes & Gilbert	59
Ox, fat, Lawes & Gilbert	49.5
Steer, seventeen months old, medium fat, Maine Experiment Station	59
Steer, seventeen months old, medium fat, Maine Experiment Station	56.3
Steer, twenty-seven months old, fat, Maine Experiment Station	51.9
Steer, twenty-seven months old, fat, Maine Experiment Station	52.2
Calf, fat, Lawes & Gilbert	64.6
Sheep, lean, Lawes & Gilbert	67.5
Sheep, well fed, Lawes & Gilbert	63.2
Sheep, half fat, Lawes & Gilbert	58.9
Sheep, fat, Lawes & Gilbert	50.9
Sheep, very fat, Lawes & Gilbert	43.3
Swine, well fed, Lawes & Gilbert	57.9
Swine, fat, Lawes & Gilbert	43.9
Chicken flesh	74.2
Fowl flesh	65.2
Goose flesh	42.3
Turkey flesh	55.5

The percentage of water varies greatly with the species, age and condition. The hog carries a much smaller proportion than the ox. The calf's body, even though fat, is comparatively watery, and it is noticeable that with oxen, sheep and hogs the lean animals carry a much larger proportion of water than the fat.

All the foregoing should serve to illustrate the necessity of proper feeding, and to seeing that your stock has at all times an adequate supply of good, pure water.

COMPOSITION OF FEEDSTUFFS.

From now on feedstuffs will be spoken of as containing certain amounts of protein, carbohydrates, fats and moisture, and it is well for the stockman and feeder to understand the various terms, as they are now in common use in agricultural publications, and, while the majority of farmers and stock feeders understand them, it will do no harm to go into them in some detail in this volume.

For the sake of brevity and convenience, all nitrogenous compounds of feedstuffs are designated by the single term protein.

In the following table will be found the average composition of American feedstuffs. It is taken from the Farmers' Bulletin, No. 22, United States Department of Agriculture, 1895. Following this is a table giving the average digestibility of American feedstuffs, taken from various authorities and compiled by Lindsay of the Massachusetts Experiment Station in 1896.

Following this, we present a table, giving the average digestible nutriment of American feedstuffs, showing the amount of nutriment that the stock feeder should obtain from each 100 pounds of the various feeds. It is, however, a deplorable fact, that while this amount of nutriment should be obtained, it is very seldom available, owing to the inability of the digestive organs of the various animals to properly assimilate it. It is for this purpose chiefly that Davis Stock Food was placed upon the market, and we will attempt to make it clear in this volume just how and why Davis Stock Food accomplishes this purpose.

TABLE No. 1
Average Composition of American Feedstuffs.

FEEDSTUFFS	PERCENTAGE COMPOSITION						No. of Analyses
	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract	
Concentrates.							
Corn, dent	10.6	1.5	10.3	2.2	70.4	5.0	86
Corn, flint	11.3	1.4	10.5	1.7	70.1	5.0	68
Corn, sweet	8.8	1.9	11.6	2.8	66.8	8.1	26
Corn meal	15.0	1.4	9.2	1.9	68.7	3.8	77
Corn cob	10.7	1.4	2.4	30.1	54.9	0.5	18
Corn and cob meal	15.1	1.5	8.5	6.6	64.8	3.5	7
Corn bran	9.1	1.3	9.0	12.7	62.2	5.8	5
Corn germ	10.7	4.0	9.8	4.1	64.0	7.4	3
Hominy chops	11.1	2.5	9.8	3.8	64.5	8.3	12
Germ meal	8.1	1.3	11.1	9.9	62.5	7.1	6
Dried starch and sugar feed	10.9	0.9	19.7	4.7	54.8	9.0	4
Starch feed, wet	65.4	0.3	6.1	3.1	22.0	3.1	12
Maize feed, Chicago	9.1	0.9	22.8	7.6	52.7	6.9	3
Grano-gluten	5.8	2.8	31.1	12.0	33.4	14.9	1
Cream gluten	8.1	0.7	36.1	1.3	39.0	14.8	3
Gluten meal	8.2	0.9	29.3	3.3	46.5	11.8	20
Gluten feed	7.8	1.1	24.0	5.3	51.2	10.6	11
Wheat, all analyses	10.5	1.8	11.9	1.8	71.9	2.1	310
Wheat, spring	10.4	1.9	12.5	1.8	71.2	2.2	13
Wheat, winter	10.5	1.8	11.8	1.8	72.0	2.1	262
Flour, high grade	12.2	0.6	14.9	0.3	70.0	2.0	1
Flour, low grade	12.0	2.0	18.0	0.9	63.3	3.9	1

TABLE No. 1—Continued.
Average Composition of American Feedstuffs.

FEEDSTUFFS.	PERCENTAGE COMPOSITION						No. of Analyses
	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract	
Concentrates.							
Flour, dark feeding.....	9.7	4.3	19.9	3.8	56.2	6.2	1
Bran, all analyses.....	11.9	5.8	15.4	9.0	53.9	4.0	88
Bran, spring wheat.....	11.5	5.4	16.1	8.0	54.5	4.5	10
Bran, winter wheat.....	12.3	5.9	16.0	8.1	53.7	4.5	7
Middlings.....	12.1	3.3	15.6	4.6	60.4	4.0	32
Shorts.....	11.8	4.6	14.9	7.4	56.8	4.0	12
Wheat screenings.....	11.6	2.9	12.5	4.9	65.1	3.0	10
Rye.....	11.6	1.9	10.6	1.7	72.5	1.7	6
Rye flour.....	13.1	0.7	6.7	0.4	78.3	0.8	4
Rye bran.....	11.6	3.6	14.7	3.5	63.8	2.8	7
Rye shorts.....	9.3	5.9	18.0	5.1	59.9	2.8	1
Barley.....	10.9	2.4	12.4	2.7	69.8	1.8	10
Barley meal.....	11.9	2.6	10.5	6.5	66.3	2.2	3
Barley screenings.....	12.2	3.6	12.3	7.3	61.8	2.8	2
Brewers' grains, wet.....	75.7	1.0	5.4	3.8	12.5	1.6	15
Brewers' grains, dry.....	8.2	3.6	19.9	11.0	51.7	5.6	3
Malt sprouts.....	10.2	5.7	23.2	10.7	48.5	1.7	4
Oats.....	11.0	3.0	11.8	9.5	59.7	5.0	30
Oatmeal.....	7.9	2.0	14.7	0.9	67.4	7.1	6
Oat feed.....	7.7	3.7	16.0	6.1	59.4	7.1	4
Oat dust.....	6.5	6.9	13.5	18.2	50.2	4.8	2
Oat hulls.....	7.3	6.7	3.3	29.7	52.1	1.0	1
Rice.....	12.4	0.4	7.4	0.2	79.2	0.4	10
Rice meal.....	10.2	8.1	12.0	5.4	51.2	13.1	2
Rice hulls.....	8.2	13.2	3.6	35.7	38.6	0.7	3
Rice bran.....	9.7	10.0	12.1	9.5	49.9	8.8	5
Rice polish.....	10.0	6.7	11.7	6.3	58.0	7.3	4
Buckwheat.....	12.6	2.0	10.0	8.7	64.5	2.2	8
Buckwheat flour.....	14.6	1.0	6.9	0.3	75.8	1.4	4
Buckwheat hulls.....	13.2	2.2	4.6	43.5	35.3	1.1	2
Buckwheat bran.....	10.5	3.0	12.4	31.9	38.8	3.3	2
Buckwheat shorts.....	11.1	5.1	27.1	8.3	40.8	7.6	2
Buckwheat middlings.....	13.2	4.8	28.9	4.1	41.9	7.1	3
Sorghum seed.....	12.8	2.1	9.1	2.6	69.8	3.6	10
Broom corn seed.....	11.5	3.4	10.2	7.1	63.6	3.0	2
Kaffir corn seed.....	9.3	1.5	9.9	1.4	74.9	3.0	1
Millet seed.....	14.0	3.3	11.8	9.5	57.4	4.0	..
Hungarian grass seed.....	9.5	5.0	9.9	7.7	63.2	4.7	1
Flaxseed.....	9.2	4.3	22.6	7.1	23.2	33.7	50
Flaxseed, ground.....	8.1	4.7	21.6	7.3	27.9	30.4	2
Linseed meal, old process.....	9.2	5.7	32.9	8.9	35.4	7.9	21
Linseed meal, new process.....	10.1	5.8	33.2	9.5	38.4	3.0	14
Cotton seed.....	10.3	3.5	18.4	23.2	24.7	19.9	5
Cotton seed, roasted.....	6.1	5.5	16.8	20.4	23.5	27.7	2
Cotton seed meal.....	8.2	7.2	42.3	5.6	23.6	13.1	35

TABLE No. 1—Continued.
Average Composition of American Feedstuffs.

FEEDSTUFFS	PERCENTAGE COMPOSITION						No. of Analyses
	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract	
Concentrates.							
Cotton seed hulls	11.1	2.8	4.2	46.3	33.4	2.2	20
Cotton seed kernels (without hulls)	6.2	4.7	31.2	3.7	17.6	36.6	2
Cocoanut cake	10.3	5.9	19.7	14.4	38.7	11.0	..
Palm nut meal	10.4	4.3	16.8	24.0	35.0	9.5	600
Sunflower seed	8.6	2.6	16.3	29.9	21.4	21.2	2
Sunflower seed cake	10.8	6.7	32.8	13.5	27.1	9.1	..
Peanut kernel (without hulls)	7.5	2.4	27.9	7.0	15.6	39.6	7
Peanut meal	10.7	4.9	47.6	5.1	23.7	8.0	2,480
Rape seed cake	10.0	7.9	31.2	11.3	30.0	9.6	500
Pea meal	10.5	2.6	20.2	14.4	51.1	1.2	2
Soja bean	10.8	4.7	34.0	4.8	28.8	16.9	8
Cow pea	14.8	3.2	20.8	4.1	55.7	1.4	5
Horse bean	11.3	3.8	26.6	7.2	50.1	1.0	1
Roughage.							
Corn Forage, Field Cured.							
Fodder corn	42.2	2.7	4.5	14.3	34.7	1.6	35
Corn stover	40.5	3.4	3.8	19.7	31.5	1.1	60
Corn husks	50.9	1.8	2.5	15.8	28.3	0.7	16
Corn leaves	30.0	5.5	6.0	21.4	35.7	1.4	17
Corn Forage, Green.							
Fodder corn, all varieties	79.3	1.2	1.8	5.0	12.2	0.5	26
Dent varieties	79.0	1.2	1.7	5.6	12.0	0.5	63
Dent, kernels, glazed	73.4	1.5	2.0	6.7	15.5	0.9	7
Flint varieties	79.8	1.1	2.0	4.3	12.1	0.7	40
Flint, kernels, glazed	77.1	1.1	2.7	4.3	14.6	0.8	10
Sweet varieties	79.1	1.3	1.9	4.4	12.8	0.5	21
Leaves and husks	66.2	2.9	2.1	8.7	19.0	1.1	4
Stripped stalks	76.1	0.7	0.5	7.3	14.9	0.5	4
Hay from Grasses.							
Hay from mixed grasses	15.3	5.5	7.4	27.2	42.1	2.5	26
Timothy, all analyses	13.2	4.4	5.9	29.0	45.0	2.5	68
Timothy, cut in full bloom	15.0	4.5	6.0	29.6	41.9	3.0	12
Timothy, cut soon after bloom	14.2	4.4	5.7	28.1	44.6	3.0	11
Timothy, cut when nearly ripe	14.1	3.9	5.0	31.1	43.7	2.2	12
Orchard grass	9.9	6.0	8.1	32.4	41.0	2.6	10
Red top, cut at different stages	8.9	5.2	7.9	28.6	47.5	1.9	9
Red top, cut in bloom	8.7	4.9	8.0	29.9	46.4	2.1	3
Kentucky bluegrass	21.2	6.3	7.8	23.0	37.8	3.9	10
Kentucky bluegrass, cut when seed in milk	24.4	7.0	6.3	24.5	34.2	3.6	4
Kentucky bluegrass, cut when seed ripe	27.8	6.4	5.8	23.8	33.2	3.0	4
Hungarian grass	7.7	6.0	7.5	27.7	49.0	2.1	13
Meadow fescue	20.0	6.8	7.0	25.9	38.4	2.7	9
Italian rye grass	8.5	6.9	7.5	30.5	45.0	1.7	4
Perennial rye grass	14.0	7.9	10.1	25.4	40.5	2.1	4
Rowen (mixed)	16.6	6.8	11.6	22.5	39.4	3.1	23

TABLE No. 1—Continued.
Average Composition of American Feedstuffs.

FEEDSTUFFS	PERCENTAGE COMPOSITION						No. of Analyses
	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract	
Hay from Grasses.							
Mixed grasses and clovers	12.9	5.5	10.1	27.6	41.3	2.6	17
Barley hay, cut in milk	15.0	4.2	8.8	24.7	44.9	2.4	1
Oat hay, cut in milk	15.0	5.2	9.3	29.2	39.0	2.3	1
Swamp hay	11.6	6.7	7.2	26.6	45.9	2.0	8
Salt marsh hay	10.4	7.7	5.5	30.0	44.1	2.4	10
Wild oat grass	14.3	3.8	5.0	25.0	48.8	3.3	1
Buttercups	9.3	5.6	9.9	30.6	41.1	3.5	2
White daisy	10.3	6.6	7.7	30.0	42.0	3.4	2
Johnson grass	10.2	6.1	7.2	28.5	45.9	2.1	2
Fresh Grass.							
Pasture grass	80.0	2.0	3.5	4.0	9.7	0.8	...
Kentucky bluegrass	65.1	2.8	4.1	9.1	17.6	1.3	18
Timothy, different stages	61.6	2.1	3.1	11.8	20.2	1.2	56
Orchard grass, in bloom	73.0	2.0	2.6	8.2	13.3	0.9	4
Red top, in bloom	65.3	2.3	2.8	11.0	17.7	0.9	5
Oat fodder	62.2	2.5	3.4	11.2	19.3	1.4	6
Rye fodder	76.6	1.8	2.6	11.6	6.8	0.6	7
Sorghum fodder	79.4	1.1	1.3	6.1	11.6	0.5	11
Barley fodder	79.0	1.8	2.7	7.9	8.0	0.6	1
Hungarian grass	71.1	1.7	3.1	9.2	14.2	0.7	14
Meadow fescue, in bloom	69.9	1.8	2.4	10.8	14.3	0.8	4
Italian rye grass, coming into bloom	73.2	2.5	3.1	6.8	13.3	1.3	24
Tall oat grass, in bloom	69.5	2.0	2.4	9.4	15.8	0.9	3
Japanese millet	75.0	1.5	2.1	7.8	13.1	0.5	12
Barnyard millet	75.0	1.9	2.4	7.0	13.1	0.6	2
Red clover	15.3	6.2	12.3	24.8	38.1	3.3	38
Red clover, in bloom	20.8	6.6	12.4	21.9	33.8	4.5	6
Red clover, mammoth	21.2	6.1	10.7	24.5	33.6	3.9	10
Alsike clover	9.7	8.3	12.8	25.6	40.7	2.9	9
White clover	9.7	8.3	15.7	24.1	39.3	2.9	7
Crimson clover	9.6	8.6	15.2	27.2	36.6	2.8	7
Japan clover	11.0	8.5	13.8	24.0	39.0	3.7	2
Alfalfa	8.4	7.4	14.3	25.0	42.7	2.2	21
Cow pea	10.7	7.5	16.6	20.1	42.2	2.2	8
Soja bean	11.3	7.2	15.4	22.3	38.6	5.2	6
Pea vine	15.0	6.7	13.7	24.7	37.6	2.3	1
Vetch	11.3	7.9	17.0	25.4	36.1	2.3	5
Serradilla	9.2	7.2	15.2	21.6	44.2	2.6	3
Flat pea	8.4	7.9	22.9	26.2	31.4	3.2	5
Peanut vines (without nuts)	7.6	10.8	10.7	23.6	42.7	4.6	6
Sanfoin	15.0	7.3	14.8	20.4	39.5	3.0	1
Fresh Legumes.							
Red clover, different stages	70.8	2.1	4.4	8.1	13.5	1.1	43
Alsike clover	74.8	2.0	3.9	7.4	11.0	0.9	4
Crimson clover	80.9	1.7	3.1	5.2	8.4	0.7	3

TABLE No. 1—Continued.
Average Composition of American Feedstuffs.

FEEDSTUFFS	PERCENTAGE COMPOSITION						No. of Analyses
	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract	
Fresh Legumes.							
Alfalfa	71.8	2.7	4.8	7.4	12.3	1.0	23
Cow pea	83.6	1.7	2.4	4.8	7.1	0.4	10
Soja bean	75.1	2.6	4.0	6.7	10.6	1.0	27
Serradilla	79.5	3.2	2.7	5.4	8.6	0.7	9
Horse bean	84.2	1.2	2.8	4.9	6.5	0.4	2
Flat pea	66.7	2.9	8.7	7.9	12.2	1.6	2
Straw.							
Wheat	9.6	4.2	3.4	38.1	43.4	1.3	7
Rye	7.1	3.2	3.0	38.9	46.6	1.2	7
Oat	9.2	5.1	4.0	37.0	42.4	2.3	12
Barley	14.2	5.7	3.5	36.0	39.0	1.5	97
Wheat chaff	14.3	9.2	4.5	36.0	34.6	1.4	...
Oat chaff	14.3	10.0	4.0	34.0	36.2	1.5	...
Buckwheat straw	9.9	5.5	5.2	43.0	35.1	1.3	3
Soja bean	10.1	5.8	4.6	40.4	37.4	1.7	4
Horse bean	9.2	8.7	8.8	37.6	34.3	1.4	1
Silage.							
Corn	79.1	1.4	1.7	6.0	11.0	0.8	99
Sorghum	76.1	1.1	0.8	6.4	15.3	0.3	6
Red clover	72.0	2.6	4.2	8.4	11.6	1.2	5
Soja bean	74.2	2.8	4.1	9.7	6.9	2.2	1
Apple pomace	85.0	0.6	1.2	3.3	8.8	1.1	1
Cow pea vine	79.3	2.9	2.7	6.0	7.6	1.5	2
Cow pea and soja bean vines, mixed	69.8	4.5	3.8	9.5	11.1	1.3	1
Field pea vine	50.1	3.5	5.9	13.0	26.0	1.6	1
Barnyard millet and soja bean	79.0	2.8	2.8	7.2	7.2	1.0	9
Corn and soja bean	76.0	2.4	2.5	7.2	11.1	0.8	4
Rye	80.8	1.6	2.4	5.8	9.2	0.3	1
Roots and Tubers.							
Potato	78.9	1.0	2.1	0.6	17.3	0.1	12
Beets, common	88.5	1.0	1.5	0.9	8.0	0.1	9
Beets, sugar	86.5	0.9	1.8	0.9	9.8	0.1	19
Beet, mangel	90.9	1.1	1.4	0.9	5.5	0.2	9
Turnip	90.5	0.8	1.1	1.2	6.2	0.2	3
Rutabaga	88.6	1.2	1.2	1.3	7.5	0.2	4
Carrot	88.6	1.0	1.1	1.3	7.6	0.4	8
Parsnip	88.3	0.7	1.6	1.0	10.2	0.2	...
Artichoke	79.5	1.0	2.6	0.8	15.9	0.2	2
Sweet potato	71.1	1.0	1.5	1.3	24.7	0.4	6
Miscellaneous.							
Cabbage	90.5	1.4	2.4	1.5	3.9	0.4	2
Spurry	75.7	4.0	2.0	4.9	12.7	0.8	1
Sugar beet leaves	88.0	2.4	2.6	2.2	4.4	0.4	...
Pumpkin (field)	90.9	0.5	1.3	1.7	5.2	0.4	...
Pumpkin (garden)	80.8	0.9	1.8	1.8	7.9	0.8	...

TABLE No. 1—Continued.
Average Composition of American Feedstuffs.

FEEDSTUFFS	PERCENTAGE COMPOSITION						No. of Analyses
	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Ether Extract	
Miscellaneous.							
Prickley comfrey	88.4	2.2	2.4	1.6	5.1	0.3	41
Rape	84.5	2.0	2.3	2.6	8.4	0.5	2
Acorns, fresh	55.3	1.0	2.5	4.4	34.8	1.9	...
Apples	80.8	0.4	0.7	1.2	16.6	0.4	3
Cow's milk	87.2	0.7	3.6	...	4.9	3.7	793
Cow's milk, colostrum	74.6	1.6	17.6	...	2.7	3.6	42
Mare's milk	91.0	0.4	2.1	...	5.3	1.2	...
Ewe's milk	81.3	0.8	6.3	...	4.7	6.8	...
Goat's milk	86.9	0.9	3.7	...	4.4	4.1	...
Sow's milk	80.8	1.1	6.2	...	4.8	7.1	7
Skim milk, gravity	90.4	0.7	3.3	...	4.7	0.9	96
Skim milk, centrifugal	90.6	0.7	3.1	...	5.3	0.3	7
Buttermilk	90.1	0.7	4.0	...	4.0	1.1	85
Whey	93.8	0.4	0.6	...	5.1	0.1	46
Dried blood	8.5	4.7	84.4	...	...	2.5	3
Meat scrap	10.7	4.1	71.2	...	0.3	13.7	144
Dried fish	10.8	29.2	48.4	...	...	11.6	6
Beef pulp	89.8	0.6	0.9	2.4	6.3	...	16
Beet molasses	20.8	10.6	9.1	...	59.5	...	35
Apple pomace	76.7	0.5	1.4	3.9	16.2	1.3	7
Sorghum bagasse	83.9	0.6	0.6	3.2	11.7	...	2
Distillery slops	93.7	0.2	1.9	0.6	2.8	0.9	1
Dried sediments from distillery slops	5.0	11.3	27.4	8.0	36.1	12.3	1

TABLE No. 2.

Average Digestibility of American Feedstuffs, with Additions from the German Tables.

A. Experiments with Ruminants.

FEEDSTUFFS	No. of Trials	Dry Matter Per Cent	Protein Per Cent	Crude Fibre Per Cent	Nitrogen Free Extract Per Cent	Ether Extract Per Cent	Authority
Concentrates.							
Dent corn	12	91	76	58	93	86	K.
Corn meal	5	88	60	..	93	92	M.
Corn cob	2	59	17	65	60	50	M.
Corn and cob meal	3	79	52	45	88	84	M.
Gluten meal	8	87	88	..	88	93	M.
Gluten meal (Chicago)	2	88	89	..	93	93	M.
Gluten meal (Kings)	2	81	91	..	79	94	M.
Gluten feed	8	84	85	72	87	83	M.
Gluten feed (Buffalo)	4	83	86	66	84	87	M.
Gluten feed (Pope's)	2	87	86	77	90	81	M.
Gluten feed (Peoria)	2	86	83	78	90	79	M.
Gluten feed (Atlas)	2	80	73	..	84	91	M.
Maize feed (Chicago)	2	84	84	72	85	90	M.
Cream gluten (Pope's)	2	93	84	..	88	98	M.
Wheat bran	11	61	79	22	69	68	M.

TABLE No. 2—Continued.
Average Digestibility of American Feedstuffs, with Additions from the German Tables.
A. Experiments with Ruminants.

FEEDSTUFFS	No. of Trials	Dry Matter Per Cent	Protein Per Cent	Crude Fiber Per Cent	Nitrogen Free Extract Per Cent	Ether Extract Per Cent	Authority
Concentrates.							
Wheat bran, spring wheat	2	63	80	24	70	76	M.
Wheat bran, winter wheat	3	62	77	27	65	64	M.
Wheat middlings	4	79	82	36	85	85	M.
Rye meal	2	87	84	..	92	64	M.
Barley	4	86	70	50	92	89	L.
Malt sprouts	1	67	80	34	69	100	M.
Brewers' grains, wet	12	63	73	40	62	86	L.
Brewers' grains, dried	2	62	79	53	59	91	M.
Oats	39	70	78	20	76	83	L.
Rice meal	12	75	63	26	86	85	L.
Flaxseed	7	77	91	61	55	86	L.
Linseed meal, old process	3	79	89	57	78	89	M.
Linseed meal, new process	3	80	85	74	84	93	M.
Cotton seed	2	66	68	76	50	87	M.
Cotton seed, roasted	2	56	47	66	51	72	M.
Cotton seed meal	6	76	88	32	64	93	M.
Cotton seed hulls	13	41	6	47	34	79	M.
Cotton seed hulls when fed with cotton seed meal	3	41	..	38	49	78	M.
Cotton seed feed (hulls and meal)	3	46	45	37	50	82	M.
Cotton seed feed (hulls and meal)	11	55	62	46	54	85	M.
Pea meal	2	87	83	26	94	55	M.
Soja bean meal	10	79	87	..	73	85	M.
Peanut feed	2	32	71	12	49	90	..
Roughage.							
Fodder Corn, Field Cured.							
Dent and flint varieties, average	23	68	55	65	73	74	M.
Dent, mature	14	66	48	57	72	76	M.
Dent, in milk	11	63	50	64	66	75	M.
Dent, immature, B. & W. (coarse)	4	57	27	59	61	76	M.
Dent, immature, no ears formed	8	65	62	71	64	66	M.
Flint, mature	9	71	65	76	73	70	M.
Flint, ears just forming	3	70	70	72	71	67	M.
Sweet, mature	6	67	64	74	68	74	M.
Corn Stover, Field Cured.							
Corn stover, all varieties	8	60	45	67	61	62	M.
Corn stover	4	62	52	67	64	52	M.
Corn stover, shredded, fed dry	2	57	40	65	56	72	M.
Corn stover, shredded, fed wet	2	60	36	70	59	74	M.
Corn stover, tops and blades	2	60	55	71	62	71	M.
Corn stover, leaves	2	56	56	61	59	63	M.
Corn stover, stalk below ear	2	67	21	74	69	80	M.
Corn stover, stalk above ear	2	55	22	71	54	64	..
Corn stover, husks	2	72	30	80	..	33	M.
Corn stover, leaves below ear	2	65	35	78	68	56	M.

TABLE No. 2—Continued.

Average Digestibility of American Feedstuffs, with Additions from the German Tables.

A. Experiments with Ruminants.

FEEDSTUFFS	No. of Trials	Dry Matter Per Cent	Protein Per Cent	Crude Fiber Per Cent	Nitrogen-Free Extract Per Cent	Ether Extract Per Cent	Authority
Corn Forage, Green.							
Dent fodder corn, average glazing and mature	13	66	53	52	74	76	M.
Dent fodder corn, mature	4	65	51	55	72	73	M.
Dent fodder corn, glazing	9	67	54	51	75	78	M.
Dent fodder corn, in milk	9	70	61	64	76	78	M.
Dent fodder corn, immature	11	68	66	67	71	68	M.
Dent fodder corn, glazing, B. & W. (coarse)	2	52	24	46	39	78	M.
Sweet fodder corn, roasting ear stage	6	72	62	60	77	79	M.
Sweet fodder corn, in milk	2	77	77	75	81	74	M.
Hay from Grasses.							
Meadow hay, rich in protein	48	67	66	63	68	57	L.
Meadow hay, medium in protein	94	61	57	60	64	53	L.
Meadow hay, poor in protein	28	56	50	56	59	49	L.
Timothy, all trials	26	57	48	52	63	57	M.
Timothy, cut in bloom	5	60	56	58	63	57	M.
Timothy, cut soon after bloom	10	53	45	47	60	53	M.
Orchard grass	3	56	60	61	55	55	M.
Red top	3	60	61	61	62	51	M.
Hungarian	2	65	60	68	67	64	M.
Mixed, rich in protein	20	58	58	60	50	48	M.
Mixed, medium in protein	2	..	40	49	58	50	M.
Rowen, average	8	65	68	66	64	47	M.
Dried pasture grass	1	71	72	77	73	60	M.
Barley hay	4	59	65	62	63	41	M.
Oats and vetch	2	58	60	66	54	19	M.
Timothy and clover, poorly cured	2	55	38	53	60	58	M.
Blue joint grass (<i>calamagrostis canadensis</i>) in bloom	2	69	70	72	69	52	M.
Blue joint grass, past bloom	1	40	57	38	43	37	M.
Wild oat grass (<i>danthonica spicata</i>)	3	64	58	68	65	50	M.
Cat's tail millet (<i>pennesetum spicatum</i>)	2	62	63	67	59	46	M.
Johnson grass	1	55	45	58	54	39	M.
Witch (quack) grass (<i>triticum repens</i>)	4	61	58	62	66	57	M.
Sorghum fodder (leaves)	2	63	61	70	65	47	M.
Sorghum bagasse (stalks after juice is removed)	1	61	14	64	65	46	M.
Swamp hay	2	39	34	33	46	44	M.
Salt hay of black grass (<i>Juncus Gerardi</i>)	2	60	63	60	56	41	M.
Low meadow fox grass (<i>spartina juncea</i>)	2	53	57	51	52	24	M.
Highgrown salt hay (largely <i>spartina juncea</i>)	2	53	63	50	53	47	M.
Branch grass (<i>spartina juncea</i> with <i>spartina stricta</i> , var. <i>glabra</i>)	2	56	62	52	54	31	M.

TABLE No. 2—Continued.
Average Digestibility of American Feedstuffs, with Additions from the German Tables.
A. Experiments with Ruminants.

FEEDSTUFFS	No. of Trials	Dry Matter Per Cent	Protein Per Cent	Crude Fiber Per Cent	Nitrogen Free Extract Per Cent	Ether Extract Per Cent	Authority
Hay from Grasses.							
Buttercups (<i>ranunculus acris</i>)	2	56	56	41	67	70	M.
White weed (ox eye daisy) (<i>leucanthemum vulgare</i>).....	2	58	58	46	67	62	M.
Straw and Chaff.							
Wheat straw	7	43	11	52	38	31	L.
Rye straw.....	9	46	21	60	37	32	L.
Oat straw	19	48	30	54	44	33	L.
Barley straw	5	53	20	56	54	42	L.
Soja bean straw	4	55	50	38	66	60	L.
Oat chaff	2	42	38	45	49	48	L.
Wheat chaff	2	26	6	37	29	34	L.
Grasses, Green.							
Pasture grasses, mixed	4	71	70	76	73	63	M.
Timothy	5	58	50	52	64	47	L.
Orchard grass, in bloom	1	56	59	51	54	51	L.
Oat fodder, in bloom.....	2	64	75	60	63	70	M.
Rye, formation of heads	2	74	79	80	71	74	M.
Sorghum, average	4	67	46	59	74	74	M.
Barley, in bloom.....	4	67	72	61	71	60	M.
Hungarian grass, early to late bloom	8	63	63	70	67	62	M.
Barley and pears, full bloom	2	60	77	43	61	60	M.
Oats and peas, bloom.....	2	68	81	57	66	74	M.
Rowen grass, mostly timothy, two-thirds grown	2	66	72	64	68	52	M.
Hay from Legumes							
Red clover in bloom	46	61	62	49	69	62	L.
Red clover, late bloom, fair quality	2	55	55	46	64	53	M.
Red clover, good quality	2	52	49	48	58	43	M.
Alsike	3	62	66	53	71	50	M.
White	1	66	73	61	70	51	M.
Crimson	9	62	69	45	62	44	M.
Alfalfa	28	60	74	43	66	39	L.
Alfalfa, late bloom	2	..	77	49	64	54	M.
Alfalfa, stage not given	1	..	69	43	72	48	M.
Cow pea vine, fair quality.....	2	59	65	43	71	50	M.
Soja bean.....	2	62	71	61	69	29	M.
Vetch	6	65	76	54	66	60	L.
Seradilla, in bloom.....	2	62	75	50	63	65	L.
Peanut vines	2	60	63	52	70	66	M.
Sanfoin	2	62	70	36	74	66	L.

TABLE No. 2—Continued.

Average Digestibility of American Feedstuffs, with Additions from the German Tables.

A. Experiments with Ruminants.

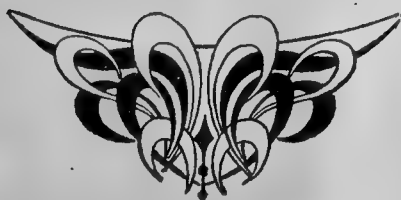
FEEDSTUFFS	No. of Trials	Dry Matter Per Cent	Protein Per Cent	Crude Fiber Per Cent	Nitrogen Free Extract Per Cent	Ether Extract Per Cent	Authority
Legumes, Green.							
Red clover, late bloom	2	66	67	53	78	65	M.
Rowen, late bloom	2	61	62	52	65	61	M.
Crimson clover, late bloom	3	69	77	56	74	66	M.
Alfalfa	2	67	81	45	76	52	L.
Cow pea, ready for soiling	2	76	74	57	84	59	M.
Soja bean, before bloom	2	66	79	50	72	54	M.
Soja bean, seed half grown	2	62	69	41	73	54	M.
Canada peas, just before bloom	2	71	82	62	71	52	M.
Silage.							
Dent corn, grain milk stage to mature	17	64	52	62	69	85	M.
Dent corn, immature	13	64	54	70	66	71	M.
Dent corn, stage uncertain	4	60	24	56	68	70	M.
Dent corn, fine crushed (steers)	2	64	38	75	65	76	M.
Dent corn, fine crushed (sheep)	2	54	22	64	55	68	M.
Dent corn, uncooked, ears mature	1	..	45	59	71	86	M.
Dent corn, cooked, ears mature	1	..	39	70	75	87	M.
Flint, ears glazing	11	75	65	77	79	82	M.
Sweet, some ears matured	2	68	54	71	72	83	M.
Soja bean	4	55	66	49	57	61	M.
Cow pea vine	4	60	57	52	72	63	M.
Barnyard millet and soja bean	4	59	57	69	59	72	M.
Corn and soja bean	3	69	65	65	75	82	M.
Roots and Tubers.							
Potato	23	85	61	..	90	..	L.
Potato	3	77	44	..	91	..	M.
Beet, mangel	18	88	77	..	96	..	L.
Beet, mangel	2	79	75	43	91	..	M.
Sugar beet	28	89	62	..	95	..	L.
Sugar beet	2	95	91	100	100	50	M.
Turnip, flat	2	93	90	100	97	98	M.
Rutabaga	2	87	80	74	95	84	M.
Miscellaneous.							
Cow's milk	5	98	94	..	98	100	L.
Acorns, fresh	2	88	83	62	91	88	L.
Dried blood	2	63	62	..	100	100	L.
Meat scrap	5	93	93	..	..	98	L.
Fish guano	2	..	90	..	..	76	L.
Beet pulp	7	82	63	83	84	..	L.

TABLE No. 2—Continued.

Average Digestibility of American Feedstuffs, with Additions from the German Tables.

B. Experiments with Pigs.

FEEDSTUFFS	No. of Trials	Dry Matter Per Cent	Protein Per Cent	Crude Fiber Per Cent	Nitrogen Free Extract Per Cent	Ether Extract Per Cent	Authority
Concentrates.							
Corn meal	4	92	86	40	95	76	L.
Corn meal	2	90	88	39	94	80	M.
Corn kernels, whole	1	83	69	38	89	46	M.
Corn and cob meal	1	76	76	29	84	82	M.
Pea meal	1	90	89	78	95	50	M.
Barley meal	8	82	76	15	90	65	L.
Barley meal	1	80	81	49	87	57	M.
Wheat, whole .....	..	72	70	30	74	60	M.
Wheat, cracked .....	..	82	80	60	83	70	M.
Wheat shorts	2	77	73	37	87	..	M.
Wheat bran	2	61	75	34	66	72	M.
Rye bran	2	67	66	9	75	58	L.
Potato	8	93	73	55	98	..	L.
Potato	4	97	84	..	98	..	M.
Dried blood	1	72	72	..	92	..	L.
Flesh meal	8	92	97	..	..	87	L.
Sour milk	1	95	96	..	99	95	L.



THE PROCESS OF DIGESTION AND ASSIMILATION.

The first process of digestion in feedstuffs occurs in the mouth when the feed is masticated or ground up by the teeth, thus preparing it for the more thorough action of the various digestive juices. While the feed is being ground, the salivary glands of the mouth excrete the saliva continuously, it is mixed with the feedstuffs and has for its purpose the conversion of the starch or carbohydrate in the feedstuffs into sugar. The saliva has no action whatever on anything except starchy matters, and the feed remains in the mouth such a comparatively short time that but little action can take place here, the action of the saliva on the starch continuing in the stomach. The chemical composition of saliva varies somewhat, but in the horse the following table is considered a fair average:

	Parts
Water	992
Mucus and albumen	2
Alkaline carbonates	1.08
Alkaline chlorids	4.92
Alkaline phosphates and phosphate lime	traces
	1000

The next process of digestion occurs in the stomach, under the influence of the gastric juices. In the different animals this varies greatly, inasmuch as the stomachs of our different domestic animals also vary to a great extent, from that of the hog holding 7 to 9 quarts, to that of the ox holding over 300 quarts. It has been ascertained with comparative accuracy that the composition of the gastric fluid is as follows:

	Parts
Water	986.14
Organic matter (especially ferments)	4.05
Sodium chlorid	4.37
Calcium chlorid .....	.11
Hydrochloric acid	4.05
Potassium chlorid	1.52
Ammonium chlorid .....	.47
Calcium phosphate	1.18
Magnesium phosphate .....	.57
Ferric phosphate .....	.33

The constituents in the gastric juice that are active in affecting the various changes are pepsin, rennet and acid. Pepsin is a soluble ferment which acts upon the feed only in the presence of dilute acid. Rennet has the power of curdling milk. Hydrochloric acid is present in considerable quantities in the gastric juice, and has for its function the change of the sugar of feed into levulose and glucose. The chief action, however, of the gastric juice is the conversion of albuminoids into peptones, leaving the fatty matter and the cellulose to be attacked later. While the horse and hog have but one stomach, the ox and sheep have stomachs consisting of four distinct compartments, namely, the rumen or paunch, which is known as the first stomach; the honeycomb or reticulum, which is the second stomach; the manyplies or omasum, which is the third stomach; while the fourth stomach is called the rennet or abomasum. This fourth stomach in ruminants corresponds to the single stomach of the horse and the pig. None of the first three stomachs secrete any fluid. The vocation of the rumen is more that of a storehouse than anything else. It is here that all the feed eaten by the cow first goes after mastication, and there it lies for some time, to be acted upon by the saliva. And a very large amount of it may be broken up and digested more or less by the process of fermentation. After the cow has the rumen well filled, the process of rumination, or what is commonly known as chewing the cud, occurs, as the feedstuff is returned in little balls from the rumen to the mouth to be remasticated by the cow and returned to

the third stomach, from which it passes rapidly into the fourth. Here the gastric juices get in their action, changing the albuminoids to peptones and breaking up the globules of fat and oil and setting their contents free.

From the stomach the food is passed into the small intestines, encountering here the action of the bile, which is secreted by the liver. The pancreatic juice also mixes with the food at this point, and the bile, containing a small amount of ferment, converts the starch into sugar. Its main function, however, is to aid in the absorption of fat. In the small intestines a part of the fat contained in the food is broken up into glycerine and fatty acids; the latter unite with the bile and pancreatic juice, forming a sort of soap, which aids in holding the remaining fat in a perfect emulsion. The bile facilitates the passage of this emulsified fat through the membranes of the intestines, aiding materially in the assimilation. The bile also has a further function, inasmuch as it prevents the putrefaction and decomposition of the food in the intestinal canal.

Pancreatic Juice.

This is one of the digestive juices that is excreted at approximately the same time as the bile, so that these fluids act together. It contains four ferments, one of which splits fats into glycerine and fatty acids; another converts starch into sugar, a third curdles milk, while the fourth changes protein compounds into soluble peptones. Unlike the gastric juice, the pancreatic juice acts upon protein as an alkaline solution. It is very essential to digestion, and is assisted materially by the component parts of Davis Stock Food, which stimulate its secretion.

The processes of digestion are continued along the small intestines next. There are a number of varieties of digestive juices excreted by the small glands in the walls of the small intestines, which further the digestive processes that have been started heretofore. Davis Stock Food is valuable here in stimulating the various glands in the walls of the intestines and increasing their excretions. It also tones up the walls of the intestines, exciting the muscles to action, should they become dormant, thus keeping the food moving and preventing constipation. Davis Stock Food is also very valuable at this time as an intestinal antiseptic, and, while it may not have come in contact with all the feedstuffs in the stomach, here it is thoroughly distributed, and will destroy the various minute organisms which find their way into the small intestines. By the time the food is carried this far the greater percentage of it is in condition to be absorbed; for it must be understood that as yet the food to all intents and purposes is outside the body. As yet the animal has derived no benefit from it. The entrance of food into the body is brought about by absorption in two different ways. The inner walls of the digestive tracts are everywhere lined with blood vessels, and everything that is soluble in water is gradually absorbed by these small vessels. The walls of the intestines are also lined with small projections, known as villi. The cells of these villi separate from the fluid contents of the intestines sugar, fat, peptones, salts and other materials and deliver them into the ducts of the lymphatic system, by which they are carried forward to the heart, to be mingled with the blood. The material drawn into the lymphatics by the villi is called chyle, and has a milky appearance, owing to the fat held in suspension. It is with this chyle and in this solution that Davis Stock Food is absorbed and held in suspension until delivered to the heart by the lymphatic vessels. If a horse is fed on hay exclusively, and we make an analysis of the chyle, we find that it contains approximately 1 per cent fat, while, if the horse is fed on oats heavily, we find that the chyle will analyze 3 per cent fat, which is in itself an excellent illustration of the food value of different articles.

By the foregoing methods we find that the body is continually assimilating and taking up material to maintain existence. On the other hand, the body must also take care of the worn out and useless tissues, which is principally done by what is known as the lymphatic system. The lymphatic system removes the broken down tissues of the body, and the material thus drained is known as the lymph. It varies greatly in composition, in accordance with the state of activity of the organs contributing to it and the locality from which it is taken. It is estimated that for every 220 pounds body weight there are 7½ pounds of lymph and 6 pounds of chyle formed daily. The rest of the broken down and poisonous matter in the system is carried through the veins by the blood, a part of it to be removed through the lungs in the form of poisonous gases. Expired air contains 45 per cent less oxygen and about the same percentage more of carbonic acid gas than the air inhaled. The lungs also throw off quite a little moisture, and it is estimated that an ordinary sized man will throw off 1½ pounds of water each day through the

lungs. All the blood of the body is filtered or purified by the kidneys. The skin also helps to throw off the impurities. For instance, the moisture given off by the sweat of a man is estimated at from 1 to 2 pounds daily; although it may be increased to 5 pounds. Carbonic acid gas and traces of ammonia are also thrown off by the skin.

Digestibility of Feedstuffs.

The one fact about all feedstuffs that interests the stockman most is the percentage of digestibility, for this is the only part of the feed that has any value to him. In milk, for instance, we have a food that is practically all digestible, and most of the nutriment contained therein yield to the digestive juices, if they are working properly. It is, however, a fact to be regretted that the digestion of our domestic animals of today is inadequate to cope with the various conditions by which they are surrounded, and exhaustive experiments have demonstrated beyond the possibility of a doubt that the percentage of indigestion among domesticated animals is very large. With one animal it is because of lack of proper mastication; in another an insufficient secretion of saliva; while in another it may be owing to an insufficient secretion of the gastric juice or lack of muscular activity in the walls of the stomach. Still another cause of the trouble is inactivity of the liver or ineffective glands in the walls of the intestines. A large majority are troubled with inadequate muscular activity in the walls of the small intestines, causing what is known technically as the arrest of peristalsis. (By the peristaltic action, from which the word peristalsis is derived, is meant the involuntary motion of the intestines tending to move the food backward continuously.) Thus it can readily be seen that, such action absent, constipation will be the result.

No matter from which one of the foregoing causes or from how many of them the animal suffers, Davis Stock Food is prepared to cope with any and all of them. It stimulates the salivary glands, and increases the secretions of the stomach. It also has a tonic effect upon the walls of the stomach, increasing the secretions of the various digestive juices and inciting the muscles to greater action. The liver is acted upon and kept in a healthy condition, so that the flow of the bile can go on uninterruptedly when it is wanted. The walls of the intestines, together with the thousands of small glands, are stimulated, and it tones up the muscles, bringing them into action, thus insuring healthy activity of the intestinal muscles and preventing constipation.

Charcoal, one of the ingredients of Davis Stock Food, absorbs all foul gases, and keeps the alimentary tract pure and sweet. Santonica is what is known technically as anthelmintic, which means to expel worms, and guards against the development of worms in the alimentary canal. The sulphur, iron, nux vomica, sodium chloride and gentian are absorbed by the small capillaries and the villi, the salt being taken directly into the blood, while the gentian, iron, sulphur and nux vomica are absorbed by the villi and carried through with the chyle. They enter the blood thus, reaching all the glands and stimulating them, at the same time purifying the blood by contact. They are thrown off by the kidneys, skin and lungs.

Feeding.

The best results are obtained from feeding when the rations contain a sufficient supply of protein, in correct proportion with the hydrates, or what is known as a balanced ration; that is, an ideal proportion for correct feeding should be one part of protein to approximately seven and one-half parts of carbohydrates. There are cases, however, where a narrower ration is advisable, but it is seldom that a ration of less than from one to five will be found profitable.

Experiments by Voif and Weiske have shown that a moderate addition of salt to the feed materially increases the activity of the secretions of the body juices and their circulation, thereby increasing the protein consumption in the body. Salt has a stimulating influence on the body of the animal and assists in facilitating the passage of albumen from the digestive canal into the blood. The feeding of salt is therefore especially valuable with horses, young animals and milch cows, when fed to their full capacity.

Salt has another action, however, inasmuch as it increases the amount of urine passed off. If, after supplying salt in an excessive amount, the animal is prevented from drinking water, the water will be drawn from the tissues of the body and the live weight of the animal will shrink very rapidly. It is therefore important that the animal should have just the proper amount of salt in its ration, and it will be found that in a great majority of cases the proportion contained in Davis Stock Food will be the

correct one. Various authorities and exhaustive experiments have determined the correct amount of salt each 1,000 pounds of live weight of the animal should have during twenty-four hours, and it is on this basis that Davis Stock Food is prepared. There are, of course, exceptional cases, but they are so few as to be scarcely worth mentioning.

The formation of fat and its storage in the body will take place whenever the supply of it in the feed exceeds the immediate demand of the system. It can therefore readily be seen that you cannot expect animals to gain weight until they have had sufficient feed to supply the body with a maintenance ration, and, after the body has taken its full quota, the surplus is then stored; thus we get our increase in the weight of live stock. All feeders know how hard it is to force a bunch of stock on full feed, and the herdsman who can turn this trick, without throwing the animals off their feed, is to be envied and congratulated by his fellows. We can honestly recommend Davis Stock Food in just such cases as this. The digestive organs and the entire system are not overworked in an attempt to digest an abnormal amount of nutrients, but Davis Stock Food, exercising its several functions, tones up and increases the capacity of the glands, increases the assimilative powers 15 to 20 per cent, thus enabling the feeder to feed under high pressure and turn his stock off in twenty to sixty days less time—a point well worthy of consideration, and one which needs no argument on our part.

As far back as 1884, Sanborn, of the Missouri Agricultural College, in Bulletin No. 10, gave his findings on the influence of feeds on pigs. He observed that pigs fed on middlings had a much larger amount of lean and a correspondingly less amount of fat than pigs fed on corn meal. He says: "Experience convinces me that the exclusive use of corn meal for a feeding ration is detrimental to a vigorous and healthy muscular development, producing a pig easily subject to disease, distasteful to consumers, and more costly than is necessary." A ration rich in protein will produce much heavier gains than one poorer in that constituent. Animals fed on protein rich rations carry a much greater amount of blood than those fed on corn. Their livers are heavier and more developed, while, as a general thing, the kidneys are likewise heavier. All of which will teach the farmer the value of the protein rich ration, and not only the value of feeding it, but the importance of seeing that it is properly digested after it is fed.

In young animals, especially pigs, it is very desirable to feed hardwood ashes and bone meal, which materially assist in the building up of bone. Especially is this true where corn is the excessive diet, at which time there is a marked tendency toward lack of development in the bony structure. Exhaustive and numerous experiments that have been conducted during the past ten years have proved beyond any question that the ration rich in protein is more conducive to rapid growth and fine general appearance for the animal when young than rations rich in carbohydrates and poor in protein.



AMERICAN FEEDSTUFFS.

Corn.

It is a peculiar fact that, of all American feedstuffs available to the stockman and farmer, corn seems to be a favorite among domestic animals. No farmer who has stood in a feed lot and watched his stock at feeding time can have failed to realize the extraordinary relish with which they eat corn. It may be possible to explain this, in part at least, by the large amount of oil it contains and also by the physical construction of it, which, upon mastication, breaks up into small, hard, nutty particles, making it much more palatable than other grains, which, upon crushing, mingle with saliva and become a sticky dough.

There are a great many varieties of corn, some flourishing in one climate and some in another, and there seems to be a popular fallacy that yellow corn is more nutritious than white; while at times you will find the reverse view taken. Exhaustive chemical analyses of both kinds can find no reason for either assumption.

One of the chief characteristics of corn as a feedstuff is the extreme richness in starchy matter or carbohydrates and a comparatively smaller percentage of protein and ash, as compared with various other grains. Therefore, for fattening processes, there is no grain that can in any way equal corn, if it is fattening alone we look for. But, lacking as it is in protein and ash, the stockman can readily see that it is ill suited for the production of bone and muscle in young and growing animals.

The cob of the corn consists largely of crude fiber, and therefore has a very low feeding value; its chief value, when ground together with the corn, making corn and cob meal, being that it supplies a certain amount of roughness or volume and has proved more digestible as a whole than the pure corn meal, which is in itself very concentrated.

While corn is the main standby in a great many of our states, yet its full merits still remain unappreciated by farmers at large. Enterprising seed houses will advertise in glowing terms the phenomenal merits of a new, heretofore unknown plant or grain. They will tell you that it will grow 50 tons to the acre, will reach a height of from 5 to 8 feet, and give the American farmer a hitherto unknown yield, but nothing has ever been developed by them anywhere near equaling corn. For example, suppose you were to read an advertisement expounding the merits of a forage plant with some high sounding name, in which the advertiser would tell you that it would grow to a height of 7 to 15 feet in four or five months, that it would produce, under favorable circumstances, 7,000 pounds of grain or 20 tons of green forage to the acre; you would certainly agree with him that it was a phenomenal plant and something that you most assuredly could use; more than that, you would probably buy it; still, the foregoing description would fit corn very nicely. There is no plant or grain which can be raised that will give the same amount of green forage per acre that corn will. But different methods, different soil, and even different seed are necessary if a farmer is to raise corn for ensilage fodder or grain. Extensive experiments have been conducted by the various experiment stations throughout the country in order to ascertain the best grade of corn for the several localities and the best methods of planting it. We present below a table of results, obtained by planting various distances apart, of experiments conducted by Hunt and Morrow, and set forth in Bulletin No. 13:

Results of Planting Corn Kernels Various Distances Apart in Rows. Average of Three Years' Trials. Illinois Station.

Thickness of Planting Distance Between Kernels in Row	Yield, per Acre			Digestible Substance per Acre		
	Kernels, per Acre	Good Ears, Bushels	Poor Ears, Bushels	Stover, Pounds	Grain, Pounds	Total, Pounds
3 inches	47,520	13	46	3,968	2,250	6,218
6 inches	23,760	37	39	3,058	2,922	5,980
9 inches	15,840	55	22	2,562	2,977	5,539
12 inches	11,880	73	16	2,480	3,113	5,593
15 inches	9,504	63	11	2,398	2,782	5,180
24 inches	5,940	49	6	2,066	2,141	4,207

You will observe that where the corn was planted but 3 inches apart and 47,000 kernels to the acre there were but 13 bushels of sound ears and 46 bushels of poor ears or nubbins per acre, while the largest yield of good ear corn came from planting 12 inches apart, 11,000 grains to the acre, which gives us 73 bushels of good corn and 16 bushels of nubbins to the acre. Morrow holds that 10,000 stocks of good corn per acre, secured by planting about 12,000 kernels, will give the best returns in grain for Illinois farmers.

Armsby, of the Pennsylvania Station, studying the returns of corn crops at four stations, reports the following yields of ears and stover:

Station	Ears	Stover
New Jersey (Dent)	4,774 lbs.	4,041 lbs.
Connecticut (Flint)	4,216 lbs.	4,630 lbs.
Wisconsin (Dent)	4,941 lbs.	4,490 lbs.
Pennsylvania (Dent)	3,727 lbs.	2,460 lbs.
Average	4,415 lbs.	3,838 lbs.

We learn from the above that somewhat more than one-half the total weight of the corn crop grown for grain is found in the ears:

Concerning the nutrients in corn, Armsby gives the following:

Digestible Nutrients in One Acre of Corn and Stover. Average of Crops at Four Stations.

Digestible Nutrients	Ears, Pounds	Stover, Pounds	Total Crop, Pounds
Protein	244	83	327
Carbohydrates	2,301	1,473	3,774
Ether Extract	125	22	147
Total	2,670	1,578	4,248
Per cent	63	37	100

We learn that 37 per cent of the total digestible nutrients in a crop of corn grown for the grain is in the stover and 63 per cent in the ears.

Wheat. Wheat during the past few years, owing to an enormous production and consequent lower prices for this grain, has come into quite general use. Inasmuch, however, as the cost of production is much higher than that of corn it is doubtful whether or not it will ever come into universal and constant use. Wheat carries a higher percentage of starch, less ether extract and more protein, stamping it as a more nearly balanced ration than corn, and one which meets the requirements of young and growing animals much better. It is a very satisfactory feed for all kinds of farm stock if used intelligently, and can oftentimes be economically added to other grains. It is also good practice occasionally to give fattening stock a change from corn to wheat, so as to give variety and keep the appetite on edge.

The feeding of wheat to both hogs and cattle, as a fattening feed, produces a meat in which there is a marked difference from that of corn fed—it producing meat of a brighter red in cattle and, if anything, more solid on pork, which is, perhaps, a little finer, and has a decidedly pleasant flavor.

At times, when wheat is bringing comparatively low prices, the farmer should never attempt to market anything but his number one—the lower grades can be fed to his stock to much better advantage and will bring him greater returns.

By Products of Wheat.

Red Dog, or what is known as low grade flour, contains most of the germs of the wheat grain, being very rich in fat and protein, giving it a high feeding value, especially for young pigs, horses on hard work, and milch cows. It will pay the farmer to watch the market for this article which he can often get for as low as \$20.00 a ton, and which will prove a profitable and economical feed at this price.

The terms middlings and shorts are somewhat synonymous, and the same will be furnished by a great many feeders if either one is asked for.

In these days of up to date milling methods shorts are very often but a ground over bran, with little or no flour in it, and therefore of comparatively small value as a feed. Middlings, in the true sense of

the term, contain quite a little of the wheat berry, and are especially valuable for feeding pigs and horses; in either case, however, they should be mixed with some other feed to obtain the best results. Skim milk and middlings, together with Davis Stock Food, make almost an ideal feed for producing bone and rapid growth in young pigs. Davis Stock Food assists materially in the digestion and assimilation.

Bran.

Bran is the husk of the wheat berry, as it were. The flakes carry with them a part of the outer layer of the wheat grain, which is very rich in protein, and in addition carries some starch. Bran has become a comparatively common feed in well managed stables, and is a most excellent feed for use in the form of a mash two or three times a week, as it is laxative in its effect and very beneficial, owing to its bulk and the amount of crude fiber it contains. It is, however, rather hard to digest, and all mashes made from it should have 1 tablespoonful of Davis Stock Food mixed with it to assist in the digestion, especially if it is fed to horses on hard work. Bran is also very valuable, when mixed with corn meal, for steers, it serving to supply bulk and protein to the feed. Perhaps, however, the one place where bran is a feed par excellence is for the dairy cow, supplying not only bulk, but protein and ash, two ingredients which are highly important in the production of milk. Bran should not be fed to young pigs, as it is too coarse and contains too much crude fiber for the digestive apparatus.

Rye.

Rye is used quite extensively in some of the foreign countries as a feed for working horses, it being added to other grains. It has been claimed, however, by dairymen, that the feeding of rye to cows imparts an objectionable flavor to butter, sometimes making it bitter. As a feed for young pigs, when mixed with other grains, it has proved very beneficial, and the quality of pork produced by it, when used in small quantities with other grains, is very satisfactory.

Oats.

At first glance it would be difficult to understand how American stockmen could get along without oats, especially the horseman. As a crop it ranks third in importance among the cereals of the United States. It is a crop that is always fairly sure, and that gives the farmer adequate returns for the labor and time necessary in its production. Properly ground, it is a feed par excellence for young pigs, owing to the high percentage of protein it contains.

New Oats as a Feed.

Practically all stockmen are familiar with the fact that new oats are unfit for feeding purposes, especially for horses, they loosening the bowels, often causing profuse diarrhea and a very soft, flabby muscle. In general terms, their use puts the animal out of condition. It is therefore important that oats be allowed to ripen in the bin, as it were, before they are used as a feed to any extent.

Mature Oats.

There is something about oats that will give mettle and life to the horse eating it that no other grain imparts. And as far back as 1845 analyses by Norton proved it to contain a stimulating principle, it being estimated that 2½ pounds of oats contain sufficient of this stimulant to exert an influence on a horse for an hour. It is claimed, however, that grinding and crushing oats destroys or weakens this principle. It is therefore not advisable to grind them for horses.

Ground oats, however, are a very satisfactory feed for dairy cattle, and with the hulls removed there is nothing better for pigs.

Barley.

While barley is one of the standard crops of the United States, its use as a feed is still more or less limited, and in some parts of the country there is quite a little prejudice against its use, some even going so far as to assert that it is detrimental as a feed. This is without foundation, however, for through numerous feeding trials with pigs it has been proved that hullless barley gives better returns than corn. Some authorities regard barley next to oats as a feed for horses.

In Europe it is a very common feed for dairy cows. It is there sown with oats, and the crop harvested and ground previous to feeding. It is regarded as one of the best feeds available.

Barley is also very beneficial in its influence on the quality of both milk and butter. For the production of pork there is nothing better, as it produces a flesh of very fine quality, hard and with an excellent flavor.

The chief use of barley in this country is by the breweries. From them we get a large amount of by products, all of which are valuable feeds. In its manufacture of beer the brewery extracts from the grains all the soluble sugar and dextrine. The result is a liquor known as wort, which, upon fermentation and further treatments, constitutes beer. It will be seen from this that the brewery does not care for grains high in protein, the reverse, in fact, being the case. Therefore the barley for the brewery is not the best for the feeder, and vice versa.

By Products as Feeds.

Malt from the breweries is undoubtedly a good feed for stock, although we do not advise feeding it by itself, it being much better to use it in a mixture with other grains. Wet brewery grains can only be fed in the vicinity of the brewery, owing to the vast amount of water they contain. These by products have led to the practice of feeding dairy cows, for the production of milk, in the vicinity of breweries in the city. Owing to the nature of the feed it has often resulted in producing very unsanitary, in some cases even filthy, surroundings which should not be tolerated in the production of milk for human use. We do not wish you to infer from this that there is anything poisonous or deleterious in wet brewery grains, or that they produce any inferior quality of milk, when supplied in medium quantities, while fresh, and fed in water tight boxes, which are kept clean. Used in this way there is nothing better for dairy cows, provided an adequate supply of nutritious hay and roughage is supplied with it.

Much better than the wet grains, however, are the dried brewery grains, which are procured by thoroughly drying all the wet grain, this giving us a concentrated feedstuff, very rich in protein and ether extract.

Another by product of the brewery is malt sprouts, which carry a very large amount of digestible protein, sometimes as high as 18 to 19 per cent, thus making an excellent feed where cattle or stock can be induced to eat it. They should be thoroughly soaked in water for several hours before feeding, as they will absorb an immense amount of it. Two to 4 pounds of sprouts can be fed to dairy cows with advantage, once they become accustomed to it.

Buckwheat.

Buckwheat is seldom used as a feed for live stock, but there are districts where large quantities of by products from the whole grain can be obtained, and, to stockmen understanding their use, they can be utilized with fairly good results. We wish to call stockmen's attention, however, to the hull, which is sometimes offered for sale, and which is practically useless, owing to the large amount of crude fiber it contains. The middlings, on the other hand, are a most excellent feed, and have a reputation for producing milk in large quantities. They should, however, only be used in connection with other feeds, and not fed by themselves.

Sorghum.

Sorghum, in this country, is used both as a human and animal food. (Kaffir corn and millets are classed with sorghum.) The yields of Kaffir corn and millets are very satisfactory. Kaffir corn is raised, especially in Kansas, in great quantities for the seed, and there are cases where it has run one hundred bushels to the acre, fifty, however, being a fair average. Enthusiasts who have fed it claim that it is fully equal to Indian corn, possibly ranking a little lower than barley in feed value. We will refer the reader to the tables in another part of this book for comparative analyses and nutritive value of this crop.

Oil Cake and Oil Meal.

The chief oil bearing seeds under cultivation in the United States are cotton and flax. In experiments carried on by the Iowa Experiment Station ground flaxseed, fed with skimmed milk, gave excellent results. As a rule, however, neither flaxseed nor cotton seed should be fed excessively, a small quantity of them being mixed with other grains, if they are to be used at all. The chief by products that the American feeder is interested in are oil cake and oil meal. These are by products from the mills. The mills first take the crushed seed and heat it. It is then placed between cloths, one on the top of another, and subjected to hydraulic pressure to extract the oil. The residue, after the pressure, appears in hard slabs. These slabs constitute the oil cake of commerce, and are used as feed. They are, in this country, usually

ground up at the mills, and the farmer buys it either this way, already ground, or in cake secured by the above process, which is known as the old process. It is, as a whole, better for feeding than the new process cake, which is made as follows:

In the new process the seed is crushed and heated as in the old, but it is then placed in a large cylinder and naphtha is poured over it, which slowly filters through and extracts the oil. Steam is then let into the cylinder, and all the naphtha which had not been drawn off heretofore is gradually driven out. This is done so effectually that no odor of naphtha remains. Next the meal is transferred to driers and is thoroughly dried, thus becoming the oil meal of commerce. This meal is less digestible than the old process product, although it contains a higher percentage of protein, and, in spite of the fact that some authorities claim that it is equal in feeding value to the old process, use does not bear out this contention.

The following is a simple method of ascertaining whether oil meal is extracted by the new or old process: First pulverize a small quantity of the meal and put a level tablespoonful into a tumbler. Add ten tablespoonfuls of boiling hot water, stir thoroughly and leave to settle. If the meal was made by the new process it will settle in the course of an hour and leave about half the water clear at the top. If the old process was resorted to the mass will remain jelly like.

Value as a Feed. There is no more valuable addition to American feedstuffs than oil cake. Its general effect is to place the animal in excellent condition, making the skin soft and pliable and giving a sleek coat. It should not, however, be fed to horses in any great quantity, as it is a fattening feed rather than a flesh hardener. It is for fattening steers and sheep that oil meal shows at its best, and two or three pounds can be given to steers (and larger amounts if the price will allow it) with very beneficial results. We cannot, however, too strongly recommend that the American stockman buy the oil cake in the nut form, especially for cattle, as it is more palatable and gives better results than when fed in the form of meal.

Cotton Seed. In the South cotton seed is a common feed for steers and dairy cows, a large percentage of it being used without treating of any kind. Roasting or boiling, however, makes it more palatable, less laxative, and productive of a more rapid gain than the raw seed, although it makes a trifle more expensive feed. Cotton seed meal is a by product of the mills. The kernels are crushed and heated, going through a process somewhat like flaxseed. Up to the present time cotton seed meal has proved a very good ration for draft horses, and further experiments with it will still closer determine its worth.

In the South a great many steers are fattened almost exclusively on cotton seed hulls and cotton seed meal, the feeder starting with a ration of 3 or 4 pounds per head, gradually increasing this amount to as high as 10 pounds per head, including all the hulls the animal will eat. Various experiments with dairy cattle have demonstrated that cotton seed meal, fed in connection with corn or other grain, will materially increase the production of milk and butter. Six pounds of cotton seed meal per head can safely be fed in addition to other grains, although, as an average, we recommend four to five. Such a method of feeding has often increased the yield of milk 15 to 25 per cent. The only effect it seems to have upon butter is that it hardens it and at the same time gives it a tallowy consistency.

Regarding the use of cotton seed meal for calves and pigs, it cannot, at the present writing, be recommended under any circumstances. In Bulletin No. 109, of the North Carolina Experiment Station, statistics regarding the feeding of two calves from one to six ounces of cotton seed report their death after one month's feeding. In Bulletin No. 21, issued by the Texas Experiment Station, Curtis sets forth the results of another experiment made by him. To make the comparison fair and equal, he took two lots of pigs, feeding one of them on corn and the other on cotton seed and cotton seed meal. The pigs fed on corn made excellent gains, with no deaths in the lot, thus demonstrating without a doubt that normal conditions were present. On the other hand, the pigs fed on cotton seed and cotton seed meal sickened and died, all within eight weeks after the feeding began. Eighty-six per cent of the pigs receiving pure cotton seed meal died; 75 per cent of the pigs receiving roasted cotton seed died; and more than 25 per cent of the lot receiving boiled cotton seed died. The pigs that lived through the above trial for a month or more were permanently stunted in their growth. The first appearance of sickness

occurred in from six to eight weeks after cotton seed meal was added to the ration. It was initiated by dullness of the animal, a loss of appetite and tendency to lie apart, quick breathing in all the fatal cases, and when the animal became exhausted it would drop suddenly, showing more or less evidence of acute internal pain. Upon the occurrence of death, a quantity of bloody foam was expelled from the mouth and nostrils.

All efforts to determine just what in cotton seed meal is the cause of this deadly effect upon the animals in question have so far proved futile; some, however, ascribing it to the lint of the seed, others to the leathery seed pulp, stating that it causes injury to the sensitive linings of the digestive tract, while still others maintain that there is a deathly poisonous principle in the seed itself, as in the case of the castor oil bean.

Uses of Cotton Seed and Cotton Seed Meal.

Taken as a whole, therefore, cotton seed meal, when used properly and in the proper proportions, is a very satisfactory supplementary feed for all kinds of live stock, except swine and calves. Wet or moldy seed, however, should never be fed.

Field Pea.

Extensive use of the pea in stock feeding among the Canadians has gradually taught the American farmer its merits. In many parts of the United States, more especially along the northern boundaries of the corn belt, extensive crops of this feed are grown. The field pea is extremely rich in protein, and is especially valuable in the feeding of pork, although too concentrated to be fed alone. It should always be fed with a mixture of other grains.

Cow Pea.

The cow pea also is quite in favor as a feed among foreigners, especially in the southern countries, because it there grows rapidly and yields an enormous forage crop. It is rather difficult, especially in the northern climates, to ripen the pea before frost sets in, and for this reason it is used largely as a forage crop. In the South, however, where it can be ripened and thrashed, the seed is most valuable. Like the field pea, it produces very satisfactory pork, and is especially valuable for bacon feeding.

Soja Bean.

This is a native of Japan, is very rich in protein, and ranks with cotton seed meal, its results in the production of butter and milk being even greater. It will prove a comparatively expensive feed, however, if the grain alone is allowed to ripen and is used, for the yield per acre is comparatively small. It has proved very satisfactory as a forage crop.

TRUE AND COMPARATIVE VALUE OF FEEDSTUFFS.

The price that must be paid on the open market for various feedstuffs does not represent their actual value as a food, by any means. Neither does the number of pounds that it is possible to get out of an acre of ground represent the feeding value of the crop. It is to these particular points that we especially would like to call stockmen's and farmers' attention.

If, for instance, a bushel of wheat weighs 60 pounds, this does not indicate that there is 60 pounds of feeding value therein, by any means. By referring to our tables, published on another page, and in which we give the average composition of American feedstuffs, it will be noted that, taking an average of 310 analyses of wheat, 10.5 per cent of wheat is water, 1.8 per cent ash, 11.9 per cent protein, 1.8 per cent crude fiber, 71.9 per cent carbohydrates, and 2.1 per cent ether extract or pure fat.

By referring to table No. 2, we find that from average experiments in the digestibility of wheat, 62 per cent of the total amount of dry matter was digestible; 77 per cent of the protein was digestible; 27 per cent of the crude fiber digestible; 65 per cent of the carbohydrates digestible; and 64 per cent

of the ether extract digestible. Our analyses showed 11.9 per cent protein, with 77 per cent of this digestible (but you must understand that this is only under the most favorable conditions). We find that we have had 9.1 parts of protein in wheat available. We find 1.8 parts of crude fiber, but find that only 27 per cent of this is digestible. Therefore only 0.4 of one part of crude fiber is available. We find 71.9 parts carbohydrates, of which but 65 per cent is digestible. Therefore, but 46.7 of the carbohydrates are available. We find 2.1 parts pure fat or ether extract, of which but 64 per cent is digestible, this leaving us but 1.3 available. In other words this will, under the most favorable circumstances, leave us 57½ per cent of our wheat available for use by the animal, and in a bushel of wheat, instead of having 60 pounds of feed, we have in reality but 34½ pounds of actual feed; and, with wheat worth 60 cents a bushel, our feed costs us 1.7 cents a pound, provided circumstances are favorable all around, which means that the system of your animal must be in perfect condition, that its bodily functions must work right, that the salivary glands must perform their functions satisfactorily, that the stomach must be doing its full share of duty, that the digestive juices are present in sufficient quantity, that the intestinal digestion is perfect, the capillaries, the villi and the lymphatic system all in perfect working order, absorbing and extracting all the nutrients. We will venture to say, without fear of contradiction of any kind, that there are comparatively few domestic animals, under ordinary conditions, that are able to extract as much as 34½ pounds of actual nutriment from a bushel of wheat. As a matter of fact, actual feeding trials will demonstrate that less than 30 pounds of nutriment can be extracted and assimilated by the ordinary domestic animal. To be fair and safe in our figures, let us say 30 pounds.

And this brings us to the mission of Davis Stock Food in a nutshell. On the foregoing pages we have told you why Davis Stock Food came into existence. We have made you familiar with the different ingredients from which it is made. In another part of this book we quote extracts from the United States Dispensatory of the actions of each and every drug used; and we think you will agree with us beyond all question of a doubt that the drugs gathered together in Davis Stock Food, form, as a whole, an ideal combination for the proper and necessary assistance of all the digestive organs. Davis Stock Food, fed to the extent of 5 tablespoonfuls to 1 bushel of wheat, will, therefore, by actual demonstration, increase the digestive juices and digestive powers of the animal to such an extent that from 15 to 20 per cent more of the grain is drawn into solution and digested. In other words, with the addition of 5 tablespoonfuls of Davis Stock Food the animal is enabled to assimilate 15 to 20 per cent more of its feed; thus, instead of its obtaining 30 pounds of actual nutriment from the grain, 6 pounds more, or 36 pounds, of actual nutriment is obtained and assimilated. Thus 5 tablespoonfuls of Davis Stock Food is equal to 6 pounds of wheat worth 60 cents a bushel, or 1 cent a pound. Five tablespoonfuls of Davis Stock Food cost you 2 cents and have saved you 6 cents, leaving you an actual profit of 4 cents; or, to carry the same illustration still further, 1 pound of Davis Stock Food costs 12 cents and will save 36 pounds of wheat, the latter worth 36 cents. At this rate, 20 cents worth of Davis Stock Food will save you 1 bushel of wheat—**actually save it, too**—for if you increase the digestibility of your animals it can readily be seen that you can feed that much less wheat and obtain the same results. You are therefore for all practical purposes buying wheat at 20 cents a bushel—certainly a good proposition and one on which we think you will agree with us. In the foregoing we have simply used wheat as an example, but the same is true of all other grains, and further on, when we attempt to give you actual maintenance rations, we will try to demonstrate what is saved in each and every grain that the stockman uses. We will show you what your ration will cost, at approximately market price, at the present time, and what you will save on a whole ration. We are now only talking of the actual money saved in the feed by the judicious use of Davis Stock Food.

We have thus far left out of the reckoning the direct, individual benefit derived by your animal, and, consequently, by yourself, which is, perhaps, of greater importance than the actual saving in feed. It will be impossible to correctly form an estimate of the actual benefit derived from a health standpoint, but we think you will agree with us that it is no small item. Another thing that we will attempt to make clear to the feeder is the most profitable combination of grains for him to use for various purposes, whether he be located north, south, east or west. In order to intelligently bring this matter to the feeder's attention, it will be necessary for him, however, to refer to the tables of analyses and familiarize himself

more or less with the actual digestive values of the various feedstuffs. This may prove a little troublesome at first, but he will find himself amply repaid. He will learn what percentage of waste the different grains have and how the coarse feeds differ from the actual grains themselves. It will teach him that, if he is feeding for the production of pork, certain grains that at first sight apparently are higher in price than others are cheaper in the long run. He will also learn that some feeds are better adapted, or, in other words, can be more easily digested, by certain animals than others, although they may be of practically the same composition. From other sources in this book he will learn that, if feeding for fat, he must obtain a grain or feed high in carbohydrates and ether extract, and he will learn from what source to obtain it, or what grains to feed in order to obtain the best and quickest results. If feeding for bacon or fat pork, he will know what feed is richest in protein, and how to use it most successfully. It is, in short, along this line that the American farmer of today must travel in order to obtain the maximum value at the minimum price. All this is necessary on account of the unequal digestibility the different grains through analyses are shown to possess. He will notice at a glance, by referring to the tables, that, while from 84 to 88 per cent of the dry matter of the cereal grains, oats excepted, is dissolved by the digestive juices, the solubility of bran and oat feeds is on an average of only about 62 per cent, oats being nearly 20 per cent less digestible than corn, barley or rye.

We are well aware that a great many farmers, unfortunately, boohoo the idea of going into matters as here suggested by us, they stating that it is red tape and useless; that old Brindle is a better judge than they or we will ever be; that they will leave it to her to get what she can out of the grain; that it is too much trouble to figure out the protein contents and the digestibility of the various grains. As Jordon ably puts it: "Once in a while someone talks thoughtlessly about leaving the question of food valuation to the old cow. It is sometimes considered a telling argument against the chemist's wisdom that he and the old cow do not agree. Certainly the cow knows better than the chemist what she likes to eat, and it is of little use to offer her feed that she does not relish. Even the chemist knows that. If, however, a dozen commercial feedstuffs were brought together upon the barn floor, it would be much safer to trust an agricultural chemist, especially one experienced in stock feeding, to select the ration than any cow ever grown. The cow would probably get at the corn meal, and stay with it until well on the road to a fatal case of indigestion; and her judgment is just about as good as that of a child with a highly cultivated sweet tooth."

There are numerous points that the stockman must take into consideration when figuring out or combining the ration. One that may look to him practically correct will prove chemically wrong, while, on the other hand, the one which seemed chemically right, may prove practically wrong. The ration must be palatable and contain neither too much bulk nor too little. The texture must be considered, so that the feed may not be too coarse nor too fine. Palatability is highly important, for unless the animal enjoys its feed and is possessed of a desire to eat it, any skillful feeder knows that the ration will fail in bringing the desired results. He must consider, also, the use to which the animal is to be put, if he would feed correctly, and be careful that the ration is suited for each particular case.

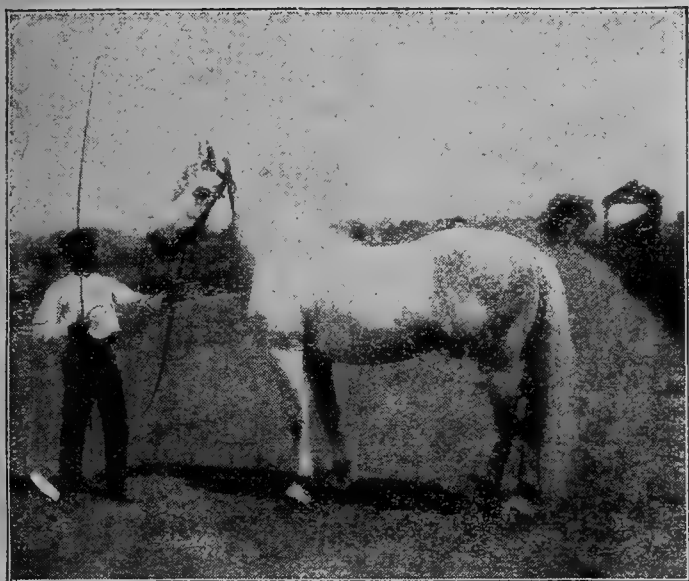


THE HORSE.

The Maintenance Ration.

By maintenance ration we mean the amount of nutritives or feed necessary to maintain 1,000 pounds of live weight for twenty-four hours, this meaning that the horse is to get sufficient feed to supply the waste of the body, without taking into consideration any gain in weight. On the other hand, the amount fed must be sufficient to provide against loss in weight.

It can easily be seen that the maintenance ration for a horse will vary greatly under different conditions. There is but one exception to the above statement, and that is in the case of growing animals or foals. Here it is necessary to supply the animal with sufficient feed, not only to maintain the body as it is, but to supply them with the necessities conducive to growth. Horses at rest will not require the same amount of feed as a horse under heavy work, etc.



Percheron Stallion,
THOR.

All of the foregoing conditions we will attempt to meet and explain in the following pages.

As the result of numerous experiments and investigations, both in this country and Europe, it has been determined beyond the shadow of a doubt that the average horse, doing average work, will require approximately 7 pounds of nutrients for each 1,000 pounds live weight, per day. This means that the horse must receive sufficient feed to obtain that amount of digestible nutrients and that it must be in such condition that the digestive organs can take care of it. It is, indeed, most important of all that the digestive organs are in condition to extract it, for it can be readily seen that if the various glands and digestive apparatus are not equal to their task the horse will grow poor instead of maintaining his weight. For this reason, in all rations, and in all figures that we quote regarding rations, it is understood, whether specifically

mentioned or not, that Davis Stock Food is to be fed in connection with the ration. If it is not, we strongly advise increasing the amount of feed at least 20 per cent, in order to allow for the waste in digestion. Following, we give a few rations, each of them figuring for a 1,000-pound horse. If your horse weighs 1,500 pounds, increase them by one-half.

Ration No. 1. For instance: No. 1 calls for 10 pounds of timothy hay, 5 pounds of good, No. 1 oats and 3 tablespoonfuls of Davis Stock Food. This for a 1,000-pound horse. If your horse weighs 1,500 pounds, it will be 15 pounds timothy hay, $7\frac{1}{2}$ pounds of oats and 3 tablespoonfuls of Davis Stock Food. This will maintain your horse for twenty-four hours. If figuring timothy hay at the rate of \$10.00 a ton, your hay will cost you $7\frac{1}{2}$ cents, your oats, counted at 32 cents a bushel, will cost you $7\frac{1}{2}$ cents, and your Davis Stock Food will cost you 1 1-5 cents, making the entire maintenance ration for your horse cost 16 1-5 cents per day. Without Davis Stock Food, it will be necessary for you to feed 18 pounds of timothy hay, worth 9 cents, 9 pounds of oats, worth 9 cents, the total figuring up at 18 cents a day, as against 16 cents if Davis Stock Food is used. This is but a fair general estimate, and illustrates our method of figuring. The rest of the rations can be computed on the same basis, as follows:

Ration No. 2. Ten and one-half pounds of timothy hay, $4\frac{1}{2}$ pounds of cracked corn and 3 tablespoonfuls of Davis Stock Food.

Ration No. 3. Eleven pounds of mixed hay, 5 pounds of bran and 3 tablespoonfuls of Davis Stock Food.

Ration No. 4. Eleven pounds of mixed hay, 4 pounds of oats, or 3 pounds of cracked corn and 3 tablespoonfuls of Davis Stock Food.

Ration No. 5. Nine pounds of timothy hay, 3 pounds of corn, 9 pounds of carrots and 3 tablespoonfuls of Davis Stock Food.

Ration No. 6. Nine pounds of mixed hay, 9 pounds of carrots, 3 pounds of oats and 3 tablespoonfuls of Davis Stock Food.

Ration No. 7. Ten pounds of mixed hay, 8 pounds of carrots, 4 pounds of bran and 3 tablespoonfuls of Davis Stock Food.

The above are a few simple illustrations, which the stockman may use, always remembering that he must add one-tenth to the ration for each 100 pounds that his horse weighs over 1,000 pounds (with the exception of Davis Stock Food, which is the same in all the rations).

A horse under heavy work in the cities will require a somewhat heavier ration than these given. For a 1,500-pound horse, on

heavy work, we would, for instance, recommend the following:

Fifteen pounds of timothy hay, 20 pounds of oats and 4 tablespoonfuls of Davis Stock Food. Without Davis Stock Food, give the horse 20 pounds of hay and 28 pounds of oats.

A horse on the above ration should consume not less than 8 gallons of water a day, which he will drink readily if Davis Stock Food is fed.

There are, of course, numerous other grains, besides oats, which a horse will eat readily, but we do not recommend them, especially for a horse on heavy work, except, perhaps, in the winter time, when one feed of corn daily will prove very beneficial, inasmuch as corn has a high value on account of the heating properties it imparts. It is also desirable, if possible, to at least twice a week give the horse a good warm mash, with 2 tablespoonfuls of Davis Stock Food added. This will serve to vary the diet and keep the bowels in good condition. Dusty hay should be avoided under all conditions, and if nothing but dusty hay is available it should be thoroughly sprinkled before placed in the manger.

It is never advisable to feed a horse whole wheat alone, but where other grains are not available it can be used if it is cracked up, not grinding it, and then it should be used in connection with other feeds. Cracked rye, a pound or so added to the ration, can also be used advantageously, but, under no circumstances, should rye be fed alone.

Corn, next to oats, is undoubtedly the most common grain used for the feeding of horses in the United States, and it always will be extensively used, especially in the corn belts. When feeding this at all, it should be fed on the cob, if possible. Corn meal is too concentrated, and the horse not only bolts it, but it will lay in the stomach in a sodden mass, thus preventing the digestive juices from working on it properly.

Numerous experiments the world over, made by companies owning large numbers of horses, and who were, therefore, vitally interested in the feeding question, have demonstrated that corn is not an



A Pair of Missouri Mules that are Hard to Beat. Owned by B. E. MIDDLETON, Mexico, Mo.



ORTLEY ROSE, No. 1705.
B. E. Middleton up. Owned by
B. E. MIDDLETON,
Mexico, Mo.

ideal feed for horses by any means, especially not for work horses. We will grant that nothing will fatten as quickly as corn, but a horse cannot be prepared for the market on corn alone, as it produces loose, flabby flesh. The horse lacks the life and ginger imparted by oats, which is so much desired by horse owners. The Paris Omnibus Company, who own and use close to 12,000 head of horses in their business, should be an authority on horse feeds. Many years ago they gave corn a thorough test. They attempted to replace oats with corn, gradually increasing the corn ration and decreasing the feeding of oats, until, at the end of four months, the horses thus dieted weighed about 15 pounds more than before they were put on the ration. They had been at work steadily; still they were in good flesh, nor had they grown too fat. All of which would seem to favor corn, were it not for the fact that they seemed soft, lost in energy and were much less spirited than on the oat feed. The company at this time, therefore, finally adopted a mixture of approximately 6 pounds of corn and 12 pounds of oats as the common ration, and their subsequent experience proved this a much better one than straight oats. On the other hand, the London Omnibus Company, owning practically as many horses as the Paris company, objected, after a thorough trial, to the use of corn as a feed for their horses, because it increased the mortality among them. The horses seemed to wear out in muscular energy much sooner, the nervous strain seemed heavier, and the result was that the veterinarian had his hands full. Berlin made similar reports. With young and growing animals, extensive research has shown that oats mixed with middlings proved a very satisfactory ration.



High School Saddler,
GLOE LIGHT.
Owned by
B. R. MIDDLETON,
Mexico, Mo.

Hay and Roughage.

Timothy hay is the most popular grass in use among American horsemen. The chief reason for this is owing to its freedom from dust. Upland Prairie is extensively used in the middle and western states. Clover hay should not be used unless it is dry and free from dust and dirt. Under these circumstances it can be fed advantageously to growing colts and idle horses. The farmer will also find fodder corn, which has been thickly sown, an excellent roughage. The horse will eat the leaves and relish them. They are full of nutriment, and can often be economically substituted for hay; in fact, the farmer who has a large amount of stock to feed will find it much to his advantage to sow more fodder corn, cutting and curing it properly when it has reached a height of 3 to 4 feet. This can, in many cases, be done with the binder, and when the farmer takes into consideration the tonnage he obtains per acre, he will be agreeably surprised with the results, and wonder why this method has not been thoroughly tested out.



A Prize Winning Four-in-Hand.
Owned by G. A. WATKINS,
Detroit, Mich.



A Pair of Prize Winning Shetlands.
Owned by G. A. WATKINS,
Detroit, Mich.



Millet hay is injurious, and should not be fed to horses.

It produces an increased action of the kidneys, causing lameness and swelled joints, injuring the texture of the bone by rendering it softer and less tenacious, often to such an extent that the ligaments and muscles are torn loose. The horseman should therefore be extremely careful in the use of millet. From the foregoing it will be seen that there is quite a field to choose from for available grains and nutriments for horses. Successful horse feeding is, indeed, an art

in itself, simple as it may seem to the initiated. The truth of this statement can easily be ascertained by noticing the horses in any large barn. Given two grooms, horses as nearly alike as possible, the same

equipment, and one team will leave the barn in fine fettle, with coats shining and in the best of flesh, seeming to grow fat on hard work, while the other team, handled by the other man, will seem lifeless, look out of condition and poorer, even though both may have received the same amount of feed. It seems as though some men have an inherent instinct, making them successful in the handling of stock, while others perform the duties mechanically, with the above results.

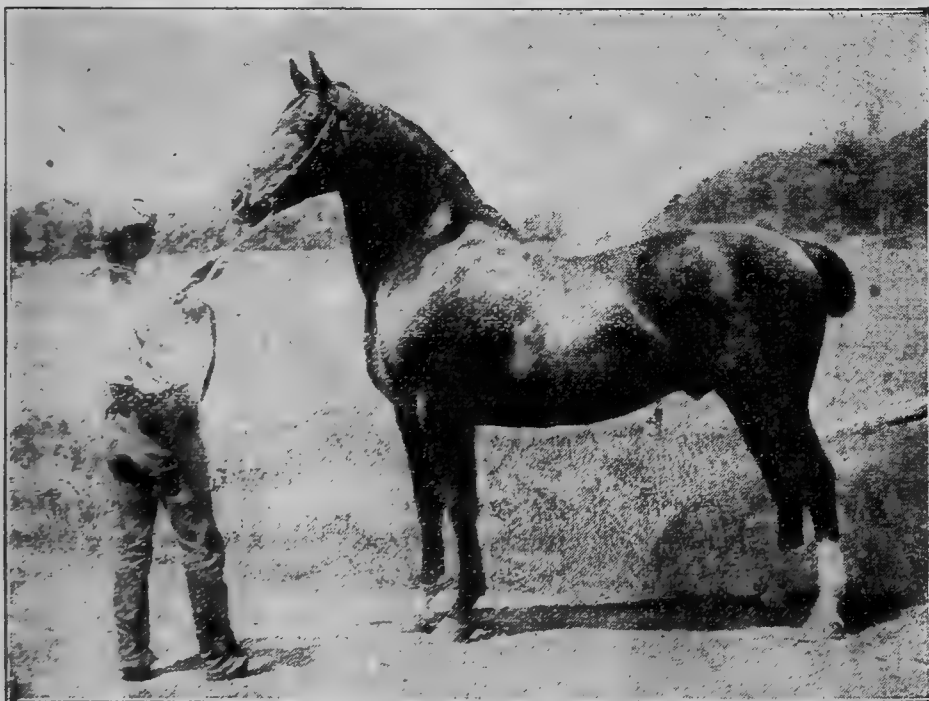
The Young Animals.

If we desire to have good horses, the training and care must start with the foal, and every man breeding or raising horses should understand the care and handling of a colt thoroughly. Every farmer or breeder knows that the young foal soon after its birth should get a good quantity of the first milk of the dam. This milk contains a substance known as colostrum, which possesses purgative properties, tending to empty and clean out the alimentary tract of the foal of the fecal matters collected there during fetal life. If the colostrum does not do this successfully, a very small dose of castor oil should be administered, together with a small teaspoonful of Davis Stock Food, thus placing the alimentary tract in condition to properly utilize the milk of the dam. All horse raisers have doubtless been troubled with the dam giving an insufficient supply of milk, in which case the mare should have an abundance of milk producing feed, with Davis Stock Food given three times a day. This will materially increase the flow of milk, and force the growth of the colt. If, in the grass season, plenty of good green grass should be given the mare and she should be put on pasture, if possible. If however, green grass is not available, oats and wheat bran, with an equal rate of corn, should be given. Even if the mare is put on pasture, it will be found good practice to give her a feed of oats twice a day for a while.

In many instances, however, just the reverse of the above conditions occurs, and there is an over-supply of milk, or the milk is too rich, thus causing indigestion and diarrhea in the colt. At such times the feed allowance to the mother should be restricted, and she should be milked by the attendant at least once a day. If the colt develops diarrhea, Davis Scour Cure is recommended. This is a remedy used by the leading veterinarians throughout the United States, perfectly harmless, and one which has been

thoroughly tested, it leaving no bad after effects whatever. When milking of the mare is made necessary, the colt should be allowed to take the first milk, the attendant stripping the last, for it should be borne in mind that the last milk carries the greatest amount of fat, which is usually the disturbing element.

To guard against this latter condition, a mare should always be confined for three or four days after foaling, her feed being restricted the first week. Should the farmer not at the moment be in possession of a bottle of Davis Scour Cure, in a great many cases scours can be checked by boiled milk, care being taken in giving it to the foal that it does not choke. After this, under favorable conditions, the dam and foal will shift for themselves, which, how-



Prize Winning French Coach Stallion,
PALADIN.
Head of Oaklawn Stud.
Owned by DUNHAM & FLETCHER, Wayne, Ill.

ever, does not mean that they should be neglected under any circumstances. In the case of constipation, a teaspoonful of Davis Stock Food, together with a small quantity of castor oil, will usually prove effective. If it is not, an injection of warm water to which soap has been added should be used.

Handling the Foal.

If the dam and foal are on pasture, the colt will usually start nibbling grass very soon. It will, however, be found good practice to place the feed box for the dam low enough so that the colt can get at it. It will be noticed that the foal will follow the mother to the box and nibble at her feed, thus acquiring a taste for grain. It will also be found beneficial to build a lot in a suitable place, and so arrange it that the foal can get through but the dam cannot. This can be done by either raising the bottom of it high enough to let the colt through, or by paneling up and down; then place a trough in this enclosure and put therein a quantity of ground grain, with which 1 tablespoonful of Davis Stock Food to every 10 pounds of grain has been mixed. This enclosure should be located near the water; and it will be found good practice to place a lump of rock salt at the side of it, thus inducing the dam to loiter around it. Thus the colt will get into the habit of running in and out, partaking of the feed often through the day, and in the course of a much shorter time than would otherwise be the case it will be found better developed and further ahead than foals not receiving similar treatment.

In many cases they will practically wean themselves, but should they not, we strongly recommend weaning not later than five or six months old. At this time the foal should also be halter broke, which can be done by first having small halters made and putting them on the colts, leaving them on all the time; not, however, attempting to lead them at once, but each time the attendant goes around to feed them he can occasionally grasp the halter and lead the colt a few steps this way and that. This method will be found very effective, and will obviate the trouble usually experienced in halter breaking the young animal.

It must be remembered that the foal is in the habit of partaking of milk from the dam many times a day. He should, therefore, have feed in front of him all the time, so that he can partake of it just as often.

Feeding after Weaning.

A great many horsemen will probably read this chapter and disagree with us regarding the methods of feeding after weaning. And they may, at that, be more nearly correct than we are, as far as their experience goes. This is easily explained, because colts are notoriously nondescript. They are awkward and vary greatly in disposition, making it impossible to lay down any possible rules but those that common

sense and patience indicate. There are, however, certain feedstuffs which have a distinct advantage as colt feeds. We know of nothing better than oats, with shorts, bran and barley taking second place. Occasionally a little corn can be used with advantage, but we do not recommend it very highly, owing to its lack in bone and muscle making material. With all those feeds, Davis Stock Food should be mixed in the proportion of 1 heaping tablespoonful for every 10 pounds of feed. It is especially advantageous in the feeding of colts, before the digestion of the young animals is fully developed, when it needs more assistance in its work of gathering the nutrients than is the case at a more mature age. In this connection it must be remembered that in nature's regime the colt can,

when grass is abundant, almost take care of itself, and cured grains are not so necessary to push its development as when this is not the case.

Teething Time.

The fact must not be overlooked that at this time the mouth is more or less sore from the teeth breaking through the gums, which makes the eating of coarse, hard grains painful, and the colt will refrain from eating rather than endure the pain resulting from mastication. To obviate this, feed steamed oats or barley taken with bran, to which Davis Stock Food has been added in proportion of 1 heaping tablespoonful to 10 pounds of grain. The practice common among some horsemen, of feeding only concentrated grains at this age is not to be recommended. Many of them do this simply because they object to the big belly



WM. PENN, 2:07½.
Owned by
N. W. BOWEN, Delphi, Ind.

which the colt usually carries at this stage. But this is no logical objection, for the colt will soon round into form.

The following table will serve as a guide as to the amount of grain that they should be fed per day up to the age of three years:

Up to the age of 1 year	From 2½ to 3 lbs.
From 1 to 2 years of age	From 4½ to 6 lbs.
From 2 to 3 years of age	From 7 to 9 lbs.



ACTIVE FOREST KING, No. 6943.
International Champion, 1905.
Owned by
TEUMAN'S PIONEER STUD FARM,
Bushnell, Ill.

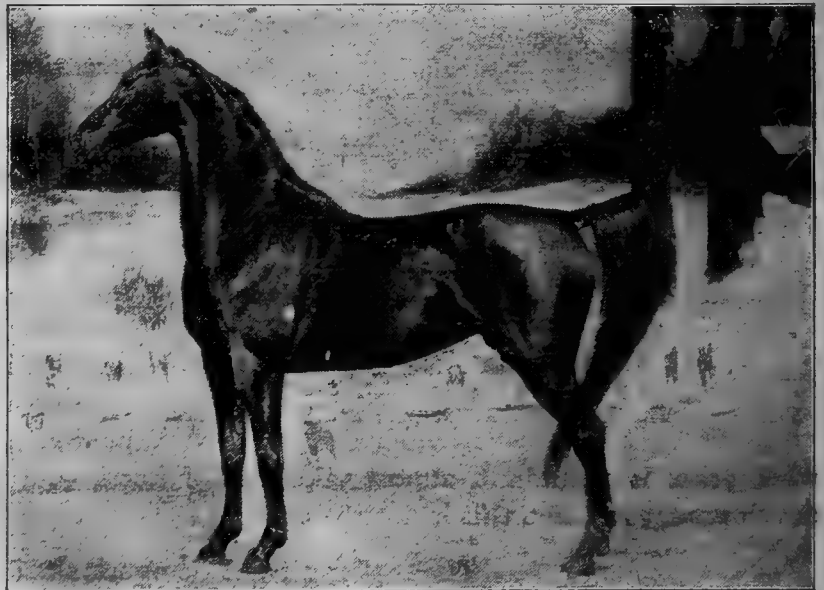
and the colt induced to drink when it will. It should also be remembered that the colt should be fed in small quantities six or eight times a day, and not be compelled to wait five or six hours for a feed. Care must be taken, however, against the too free use of cow's milk in feeding foals. It is much better to make a mash of milk and bran with Davis Stock Food added, inducing the colt to partake of this as soon as possible, for the excessive feeding of colts by hand on cow's milk is largely instrumental in producing windsuckers:

The Stallion. There is no better grain to use in the feeding of stallions than good, sound oats. They should, however, not be used excessively. It is advisable to vary the diet occasionally with a ration of corn or barley, and, once a week at least, a good bran mash. The addition of a tablespoonful of Davis Stock Food to each feed for the stallion is especially recommended. It keeps his blood pure and the digestive apparatus in healthy condition. The entire system is toned up when the stallion is fed regularly on Davis

With this should be given a good allowance of hay, although the colt should never have all the hay in front of it that it will eat. Rather supply it with a certain amount, and keep the appetite keen. An oversupply tends to gorge the digestive tract with more matter than it can take care of, and such treatment may result in lasting injury to the colt.

Raising by Hand.

There are cases where sickness or death of the dam makes it necessary to raise a colt by hand. At such times, if the foal has never received any of the mother's milk, the bowels should be emptied by a small dose of castor oil to which has been added a small teaspoonful of Davis Stock Food. To one quart of cow's milk, add one-half pint of water, a tablespoonful of sugar and a teaspoonful of Davis Stock Food. This should be heated to blood temperature



CAROLINA, Reg. No. 32931.
Owned by
JOHN B. CASTLEMAN,
Louisville, Ky.

Stock Food, and a higher percentage of colts and better foals will be the result. He should also be given plenty of exercise, so that he will not become overloaded with fat. The exercise, however, should be confined to a walk, four or five miles a day, if the stallion be a draft horse; if a roadster, possibly six to eight, but not more. We do not recommend the feeding or giving of various nostrums and mixtures to the stallion to increase his foal getting power. This is not only the rankest nonsense, but, in many cases, harmful as well. Anything that will tend to increase the general health and vigor of the horse, will likewise increase his ability as a foal getter by adding to his virility and sexual power.

Care of the Mare.

This, of course, principally applies to the mare in foal. A mare not in foal should receive practically the same treatment as the horse; but with mares used for breeding purposes, we would recommend, if anything, an excessive protein ration. By this we mean a feeding ration of possibly one part protein to six parts carbohydrates. Another point worth remembering is that a mare used for ordinary work during the gestation period usually brings forth a better foal than one who is allowed to run idle during the entire period of pregnancy.

The period of gestation will average about 330 days, seldom less than 287 days, and very seldom, indeed, last longer than 420 days, although such cases are on record. As in the stallion, it will be found that if the mare is fed regularly with Davis Stock Food, mixed in proper proportion with her other feed, it will aid in the exercise of her normal functions and keep her system in perfect condition, bringing forth a fine, healthy colt. The one thing which it is necessary to bear in mind in the care of a pregnant mare is to avoid constipation, and this Davis Stock Food accomplishes, keeping the bowels open and working naturally.

Ration for Carriage Horses.

There is no doubt but that oats lead all other feeds as a ration for the carriage horse, containing as they do a stimulating principle which gives the horse mettle and energy, thus liberating style and action. For a variety, an occasional feed of rolled barley with bran will prove beneficial. For the average carriage horse, it will be found that from $3\frac{1}{2}$ to 4 quarts of oats at a feed, together with 1 tablespoonful of Davis Stock Food, will prove sufficient to keep him in good condition. If, however, the horse is working during the regular hours of the day, and especially around meal time, we advise the use of 3 quarts of oats in the morning, with a tablespoonful of Davis Stock Food; 3 quarts of oats at noon, with a tablespoonful of Davis Stock Food; and 6 quarts at night, with a tablespoonful of Davis Stock Food. After the evening feed hay should be withheld for at least an hour, preferably one hour and a half, when 10 to 12 pounds of hay, free from dust, may be put in the manger. Should the horse suddenly be laid off, and the owner is not in a position to give him sufficient exercise, the above ration should be reduced at least 30 per cent, giving not over 8 pounds of oats during the entire day, with the largest feed at night. Do not feel for a moment that this is an unkindness to the horse, for, in fact, it is just the reverse. You will understand that the full feed we prescribe, 12 pounds of oats a day, will not only provide maintenance for the body, but also supply the fuel and energy necessary in his work, if Davis Stock Food is used regularly; if it is omitted, increase the feed allowance 20 per cent.



Champion Saddle Stallion,
BLACK ARTIST.

Winner of 31 Sweepstakes and 1st Prizes.

Owned by LEE BROS.,
San Angelo, Texas.

Feeding the Draft Horse.

The draft horse, on heavy work, is entitled to care and consideration in the supply and preparation of his ration. He certainly earns it and will repay amply the attention given him. His appetite is usually hearty, and care should be taken not to do or give him anything that will cause loss of appetite. In supplying a ration for the draft horse we would still recommend a straight oats ration, with perhaps a bran mash two or three times a week. At times, however, oats constitute too costly a ration to be used exclusively, and at such times we would recommend rolled wheat and rolled barley, added to the oats in proportion of half and half, or a corn and cob meal and oats ration, the corn and cob meal mixed in proportion of one-third corn and cob meal and two-thirds oats, will prove very beneficial. In addition to this we would advise the limited use of roots, such as carrots, whenever available. Regarding hay, a good rule to go by is to give the horses 2 pounds of hay for each 100 pounds of their weight. Thus the hay ration to a 1,200-pound horse should be 24 pounds. This is when the horse is used on heavy work. We also advise the evening feed for the work horse to consist of at least one-half of the day's grain allowance—that is, suppose you should be giving 8 quarts to a feed, thus

making a total of 24 quarts a day, instead of giving the horse 8 quarts morning, noon and night, give him 6 in the morning, 6 at noon and 12 at night, always adding to each feed a heaping tablespoonful of Davis Stock Food. By using Davis Stock Food you will be enabled to reduce the amount of grain from 15 to 20 per cent. We at least ask all feeders to try our method. It has been thoroughly tested by some of the largest team owners in the country, and there is absolutely no risk connected with its use. The ingredients are well known and harmless, and no matter from whom you buy Davis Stock Food, your money will be cheerfully refunded if you are not entirely satisfied with the results. We would also like to call your attention to the fact that, unlike other so called stock foods on the market, in the case of Davis Stock Food you know exactly what you are getting, as the formula is printed in plain letters on each and every package.



CASINO (45462) 27320

Percheron Stallion,
CASINO, No. 45462.
Winner St. Louis World's Fair.
 Owned by
J. W. and J. C. ROBISON,
Towanda, Kan.

We would also call the horseman's attention to the importance of cutting the grain ration in two whenever the horse is laid off for a day, this for the same reason which we advanced in the case of carriage horses in the preceding paragraphs. Comparatively few horsemen are aware of the fact that failing to do this is the cause of numerous cases of azorturia. If you would avoid this fatal disease among your horses, by all means cut down the allowance on idle days.

Horses should always be watered before feeding, and also an hour or so after, if convenient. We cannot too strongly urge, however, the importance of giving a horse all the water he wants. By this we do not mean to withhold the water for six or seven hours, and then take the horse to the trough and allow him to drink an unlimited amount. Try to arrange it so that the horse may have a drink every hour, if he wishes it. In other words, at any time he wants it.

It is mistaken kindness to keep the manger filled with hay because the horse is confined to the stall sometimes for ten to twelve hours on a stretch. He falls into the habit of gorging himself with hay, under such circumstances, continuing to eat of it as long as it remains in front of him, not only causing a waste, but doing himself a severe injury by weakening the entire digestive system. And there is still another point which must be taken into consideration by the humane and careful feeder, namely, the regulation of the feeding hours for his horses. By all means, have certain hours for feeding and adhere to them as nearly as possible. The digestive system and the whole body soon accustoms itself to this order, with the natural consequence that they become thrifty and remain healthy.

In the following table we give a list of the rations used by the armies in the various countries:

GOVERNMENT	WEIGHT OF HORSE	RATION	
		Concentrates	Roughage
United States, Artillery	1,050 to 1,200 lbs	12 lbs. oats, corn or barley	14 lbs. hay.
United States, Cavalry	950 to 1,150 lbs	12 lbs. oats, corn or barley	14 lbs. hay.
Germany, Cavalry	1,050 lbs	10 lbs. oats	{ 5.5 lbs. hay. 7.7 lbs. straw.
Germany, Cavalry, Officers		11 lbs. oats	{ 5.5 lbs. hay. 7.7 lbs. straw.
Great Britain; Cavalry		10 lbs. oats	{ 12 lbs. hay. 8 lbs. straw.
Great Britain, Cavalry	Severe duty	12-14 lbs. oats	{ 12 lbs. hay. 8 lbs. straw.

Following this is a list of the rations given by the street car companies to their horses, covering various cities of England and Europe:

Rations for British Tramway (Street Car) Horses.—Fleming.

London	Liverpool	Glasgow	Edinburgh	Dublin
Pounds	Pounds	Pounds	Pounds	Pounds
Corn 7	Corn 12	Oats 6	Oats 8	Corn 14
Oats 3	Beans 4	Corn 11	Corn 4	Oats 3
Peas 3	Cut hay 14	Hay 8.5	Beans 4	Hay 12
Hay 12	Bran 1	Straw 1	Hay 14	Bran 5
Straw 1		Bran 5	Marshlum 2	

Rations for Street Car Horses in Various European Cities.—Mattes.

CITY	Daily Allowance Per Horse				Nutrients in Ratio			
	Corn	Oats	Hay	Straw	Protein	Carbohy- drates	Fat	Nutritive Ratio
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Bremen	14.3	2.2	8.8	2.2	2.03	13.38	.75	1:7.7
Brussels	7.7	11	4.4	3.3	1.76	11.42	.84	1:7.7
Bordeaux—								
Winter	15.4		13.2	1.1	1.94	13.96	.75	1:8.2
Summer	11	4.4	13.2	1.1	1.94	12.85	.75	1:7.6
Hamburg	17.6	1.7	7.7	4.4	2.01	15.17	.86	1:8.6
Munich	6.6	11	5.5	4.4	1.76	11.13	.79	1:7.4
Vienna		15.4	11	2.2	1.83	13.54	.73	1:8.4



IMPORTED ALBANY, No. 132876.
 Undefeated English Champion.
 Imported by C. A. JAMISON of Peoria, Ill.
 To head his "Four Hundred"—the Hamlet Herefords—at Hamlet, Indiana.

CATTLE FEEDING.

The Calf.

In the calf, nature intended milk to be the chief feed for the first few weeks of its life, and, as in the case of the colt, the calf should receive the first milk of the mother, called colostrum, soon after its birth, so that it may clear the alimentary canal and get it in condition to properly digest and assimilate subsequent food. As stated previously in connection with the mare, milk is the ideal diet for the young animal, nature having proportioned its ingredients perfectly, it being comparatively rich in protein, thus enabling the calf to consume relatively larger quantities of protein in comparatively small bulk, supplying the growing animal with that element most essential. In these days of the cream separator, when the calf can be most profitably fed on skim milk, radical changes have been made in methods and extensive experiments conducted in order to find a substitute for the fat extracted by the separator. Naturally, in the looking for a substitute to replace these fats, we turn to carbohydrates, the most concentrated of which is sugar. In experiments by Wolff, with three calves, each fourteen days old, and weighing 117, 130 and 114 pounds, respectively, we find the following results:

Calf No. 1 was given 13.2 pounds cow's milk, mixed with an equal amount of whey; calf No. 2 was given 22 pounds of skim milk, and calf No. 3, 17.6 pounds of milk and 3.9 of cream. To this was added sugar in the amounts specified in the table:

	Consumed					Gain Per Day, Pounds	Pounds of Organic Matter to 1 Pound of Growth
	Organic Substance, Pounds	Protein, Pounds	Sugar, Pounds	Nutritive Ratio, 1:			
				Fat, Pounds			
No. 1	2.3	.54	1.29	.51	4.8	1.88	1.35
No. 2	2	.70	1.02	.22	2.2	1.14	1.88
No. 3	3	.73	1.02	1.22	5.6	3.38	.97

The most interesting point about these experiments is the demonstration of the fact that an actual gain can be brought about by a ration comparatively poor in protein, but having a wide nutritive ratio.



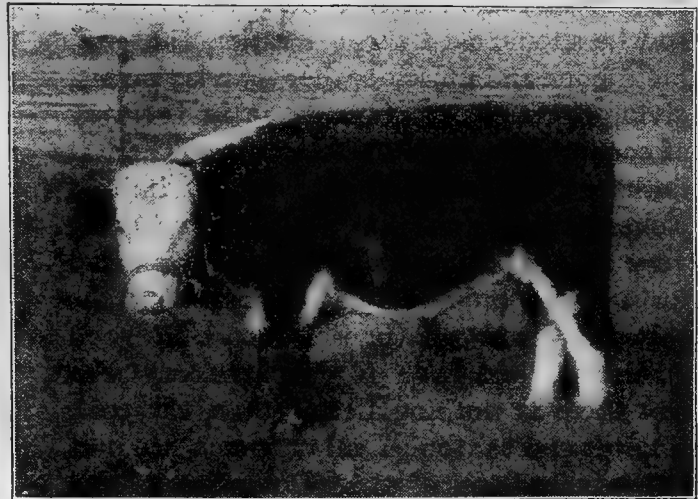
Carload of S. M. S. White Face Calves.
 Bred and Raised by
SWENSON BROS., Stamford, Texas.

Sold to Dan Black, Lyndon, Ohio, who fed them and later exhibited the carload at the International at Chicago, 1904, winning grand championship for feeders of all ages and classes. Other picture on following page shows them in finished form.

ture and has been thoroughly tested. The proportion of this should be about one part flaxseed meal to five parts milk. This should be gradually increased to one-fifth flaxseed meal. This ration, however, is rather expensive, and should not be continued beyond ninety days. During this entire period the calf should have access to feed troughs containing dry oatmeal, to each 10 pounds of which 1 tablespoonful of Davis Stock Food has been added. It will be found that the calves, inside of ninety days, will be eating a considerable amount of this mixture, thus preparing them for weaning. The above methods will produce a rapid growth, provided Davis Stock Food is used regularly. By this we, of course, do not mean that the desired growth cannot be obtained without the use of Davis Stock Food, but the growth will be much more satisfactory and the general health of the animal better where it is used regularly.

A great many stockmen have been very successful in raising the orphan calf on hay tea. The hay should be cut early, so that it contains intact the most soluble matters. It should thereupon be chopped up fine, placed in a sufficient quantity of water and boiled down quite well, so that it does not contain too much water. This will extract all the soluble constituents of hay, resulting in a tea which is as digestible as milk. To each 2

It also demonstrates thoroughly that sugar can be advantageously used instead of the more costly fat, although it still remains doubtful as to whether carbohydrates can be used to replace fats entirely. In addition to this it is not advisable, however, for the average farmer to buy any more material than necessary to use in his feeds. What he wants is to secure as rapid a growth as possible, and we would recommend the feeding of skim milk, to which a reasonable amount of Davis Stock Food and ground oats (with the hulls removed) has been added. Flaxseed meal, cooked to a porridge and mixed with the milk, together with one tablespoonful of Davis Stock Food is an admirable mixture



BLACK'S OHIO CHAMPION.

Bred and Raised by
SWENSON BROS., Stamford, Texas.

Fed by Dan Black, Lyndon, Ohio, and sold by him to Ohio State Agricultural College, where he is being fitted for the International.



Carload of Feeders, **GRAND CHAMPIONS**, International, 1904.
From the Famous S. M. S. Ranch.
Owned by **SWENSON BROS.**, Stamford, Texas.
Fed and Exhibited by **Dan Black**, Lyndon, Ohio.

while the dairy calf will be in fair flesh, and have a bright, alert eye. The stockman should now appreciate the fact that at no stage of the animal's life can gains be made so cheaply, and this should be a natural reason for his pushing them ahead as rapidly as possible. He must not, however, look only for gain in pounds per day, but, remember that in the calf it is the material for the making of a mature animal which counts, and to this end he should feed them a ration that will build bone and muscle rather than lay on fat, giving them plenty of roughage in the way of corn forage, clover, alfalfa, etc. There is nothing that can compare with alfalfa and clover for young animals, both of them being very rich in protein and therefore unequalled for system building. The bowels of the calves must at all times be kept in good condition, and free from parasites. For this there is nothing better than charcoal, sulphur and santonica, all of which are part of the ingredients of which Davis Stock Food is composed. Davis Stock Food should therefore be a regular part of calves' ration if the best results are to be obtained.

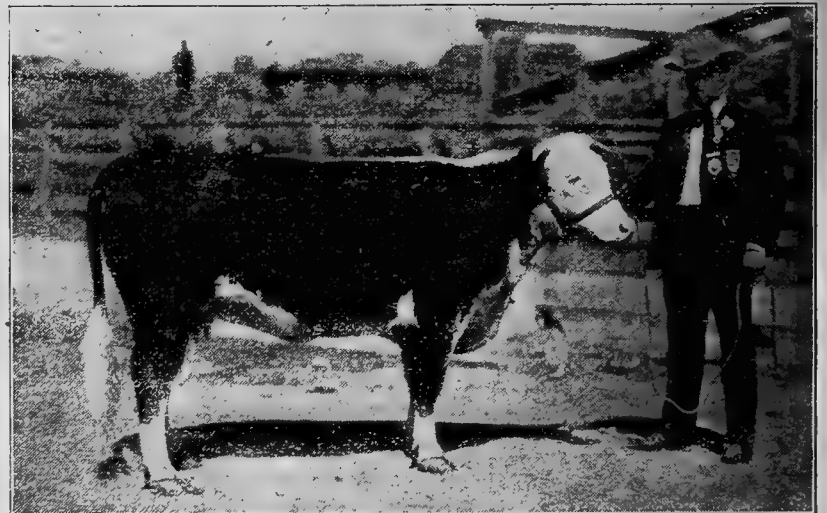
Feeding for Beef.

The methods adopted in the feeding for beef must necessarily vary in different parts of the country. From the various State Experiment Stations, and the experience of well known feeders, we have, however, attempted to show the results, approximately, that should be expected from each section. The successful production of beef on the farm is one of the hardest problems, everything taken into consideration,

gallons of this hay tea add 4 ounces of flaxseed and 4 ounces of wheat middlings, with 1 tablespoonful of Davis Stock Food; mix thoroughly. Two gallons will be sufficient for one day for a calf; in fact, a calf may not drink that much at first. It will, however, soon get to like it, and as its appetite increases, increase the amount of wheat middlings to a pound a day for each calf. If properly prepared, calves will make surprising gains on this ration, and the farmer should have no trouble in obtaining a gain of 2 pounds a day.

A f t e r We assume
Weaning. that the raisers
of calves here-
tofore have

taken into consideration the use to which they were to be put. If they were intended for beef production, they should at this point be thrifty, fat and with a sleek coat,



LEEDALE QUEEN.
Grand Champion Female, World's Fair, 1904.
Grand Champion Female, San Antonio Fair, 1904.
Junior Champion Female, Ft. Worth, 1905,
and 16 first prizes at other shows.
Bred and Owned by **LEE BROS.**, San Angelo, Texas.



LADY BRITON 16th, No. 90715. Sweepstakes Cow at Pan-American Exposition, Buffalo, 1901. Owned by C. G. COMSTOCK & SON, Albany, Mo.

with which the farmer has to deal, although, on the face of it, it may seem comparatively simple. It is comparatively easy for any of us to fatten cattle. It is also comparatively easy for any of us to feed economically; but to obtain both results at one and the same time, and still keep the appetite of the steer on edge, is a question that has been the bane of the world's most successful feeders for many years. In the early stage of the feeding period it is a comparatively easy matter to regulate the feed in the proper proportion and obtain the desired results, but as the period



Champion Hereford Bull, POLSON, No. 49230. Owned by LEE BROS., San Angelo, Texas.

advances it becomes more and more difficult, the animal acquiring a more dainty appetite and is therefore more easily thrown off his feed. Every experienced feeder knows that no greater calamity could occur in the feed lot than to have his animals suddenly go off their feed and before they can be brought back he will have lost, in many instances, the entire profit on the bunch. Many other things must be taken into consideration as well, such as the

weather, the environment, the attendants, etc. The Kansas Station conducted a trial on corn and corn meal with two bunches of steers, with the result shown in the following table:



BLACKBIRD 24th. 1st Prize Aberdeen Angus Cow, at World's Fair, 1904. Owned by C. J. MARTIN, Churdan, Iowa.



ONWARD 4th, No. 123694. Champion Hereford Bull at American Royal Live Stock Exposition, 1903-1904. Kansas City. Owned by S. L. STANDISH, Breeder of Hereford Cattle, Hume, Kansas.

Feeding Corn and Corn Meal to Steers.—Kansas Station.

FEED	Average Weight of Steer at Beginning	Total Grain Eaten	Fodder Eaten	Total Gain	Feed for 100 Pounds Gain	
					Grain	Stover
First Trial.						
Corn meal.	1,211	3,575	940	268	1,334	350
Ear corn.	1,215	4,027	1,341	284	1,418	472
Second Trial.						
Corn meal.	1,129	2,646	607	290	911	209
Ear corn.	1,158	3,223	535	230	1,402	232



YOUNG ALICE'S PRINCE, No. 17111,
and **ROYAL PRINCESS.**
Grand Champion Bull and Cow,
World's Fair, St. Louis, 1904. Owned by
DURHAM PARK STOCK FARM,
David Harrell, Proprietor,
Liberty Hill, Texas.

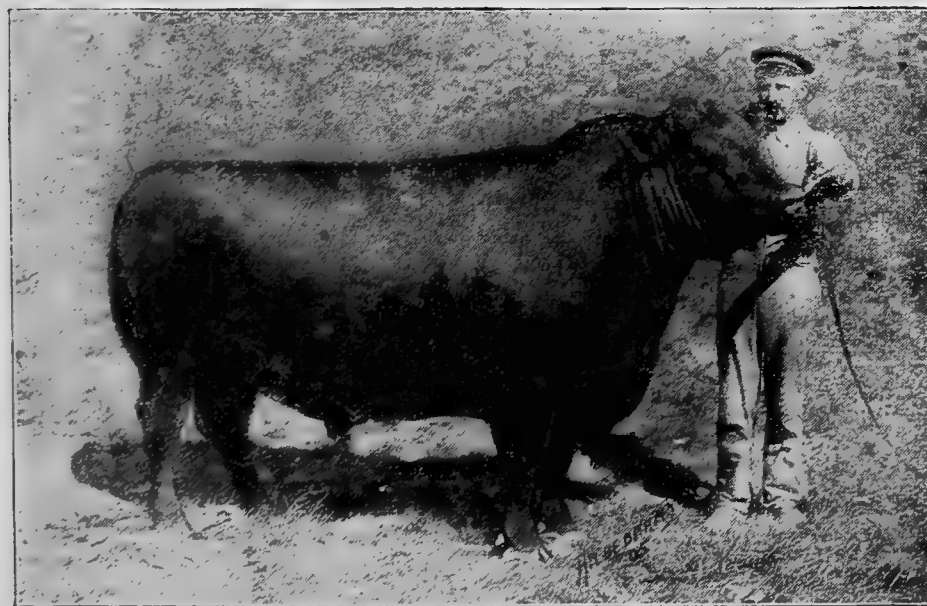
on corn meal consumed a total of 2,646 pounds of corn meal and 607 pounds of stover. They gained in weight 290 pounds in five months.

The above tests are fairly representative, and, although not high pressure feeding by any means, serve to illustrate the difference in value between corn meal and ear corn. While these gains are very satisfactory as a whole, they can be increased materially by the judicious use of Davis Stock Food, for it goes without saying that the more grain you can induce

There were five steers in each of these lots, and the first trial lasted six months, the second five. The animals used were ranch steers in the first instance, and grade Shorthorns in the second. All were from two to three years of age. By looking over the table you will notice that the steers fed on ear corn gained considerably more than those fed on corn meal, but it required more grain to obtain the increase. This can perhaps be explained by the fact that the ear corn was not properly masticated and broken up. The digestive juices therefore had a better opportunity to exercise their functions on the corn meal. The second trial especially is in favor of the corn meal ration. In the second trial the five animals fed



FLUCK'S EXPECTATION and FLUCK'S PROXY.
Grand Champion and Prize Winning Steers at World's Fair, St. Louis, 1904,
and Chicago International.
Bred and Owned by **H. J. FLUCK, Goodenow, Ill.**



Aberdeen Angus Bull, ZAIRE THE GREAT, No. 49792.
1st Prize Winner International, 1904.
Bred and Exhibited by **M. P. and S. E. LANTZ, Carlock, Ill.**

steers to eat (provided, of course, they digest all of it), the more profitable will be the venture. Davis Stock Food gives them a keen appetite, inducing them to eat larger quantities, at the same time it takes care of the digestive organs and enables them to digest a larger percentage of feed than they could possibly do without its assistance. It is easy enough for us to tell you this, and we might add that we know it, but every man ought to use his own judgment; and if the foregoing statements can be borne out through practical tests, the American farmer or stockman is enterprising enough to adopt the methods that will assist him in obtaining the results most desired.

He can demonstrate our assertions to his own satisfaction, incurring no risk whatever, for the money is cheerfully refunded in every instance unless all our statements are borne out by actual tests.



Prize Winning Aberdeen Angus Steer, PLUNKELL.
Bred and Exhibited by M. P. and S. E. LANTZ,
Carlock, Ill.

Feeding steers today is hardly a profitable proposition unless hogs are run after them to pick up the grain and corn that passes through them undigested. In the case of ear corn especially this is absolutely necessary, but with ground feed, to which has been added 1 tablespoonful of Davis Stock Food to every 5 pounds of grain, but little feed will pass through undigested and the hogs would get but a scant living unless they were fed regularly, the steers being able to digest and assimilate practically all of the nutrients contained in the feed. Corn and cob meal will, however, give better gains than corn meal alone. With the assistance of a good digestion and a tonic, good steers can be made to gain from 2 to 3

pounds a day. In a great many sections of the country farmers have mills that will grind corn cob and husk together. We advise the use of this, as extensive trials and experiments have shown that there is a material saving therein, and, at the same time, the steers are kept in better health. It will be found profitable to add oil meal or cotton seed meal to the corn ration.

Kaffir Corn. In the western states

Kaffir corn has, within recent years, risen much in the feeders' favor. Especially is this the case in Kansas where Georgeson, of the Kansas Experiment Station, conducted feeding experiments with Kaffir corn and corn meal with the results shown in the following table:



RUBY OF BUTTONWOOD.
Grand Champion Polled Durhams at World's Fair, St. Louis, and
Champion for Four Years at International, Chicago.
"Never Defeated in the Show Ring."
Owned by ARCADIA FARM, Flescher S. Hines, Proprietor,
Malott Park, Ind.

Feeding Kaffir Corn in Comparison with Corn and Corn Meal to Steers.—Kansas Station.

FEED	Average Weight at Beginning, Pounds	Feed Eaten		Average Gain per Steer, Pounds	Feed for 100 lbs. Gain	
		Grain, Pounds	Roughage, Pounds		Grain, Pounds	Roughage, Pounds
Lot 1, corn meal	1,036	16,271	9,297	326	997	569
Lot 2, red Kaffir corn meal	1,021	16,271	10,300	299	1,086	688
Lot 3, white Kaffir corn meal	1,025	16,271	10,828	313	1,041	692

The results of these tests, as shown by the table, demonstrate that Kaffir corn compares favorably with maize. The same results can be obtained by any feeder in the states in which Kaffir corn can be profitably grown, and even better results can be obtained if Davis Stock Food is used. Thus far we have taken into consideration the feeding of only one kind of grain at a time, but the stockman knows by this time that a combination of two or more grains will usually give better results than any one of the grains alone, provided the mixture is properly balanced. Again, the Kansas Experiment Station furnishes us data to show the value of a properly balanced ration. They conducted exhaustive tests with steers, using ear corn in one case and a balanced ration, consisting of corn meal, oil meal, bran and shorts in another ration (all properly balanced.) It required 1,275 pounds of corn for each 100 pounds gain, while but 905 pounds of the balanced ration was necessary to produce 100 pounds gain, thus showing a material saving and demonstrating the value of the balanced ration.



THE WOODS PRINCIPAL.
Champion Hereford Steer.
Owned by GEO. P. HENRY, Goodenow, Ill.

Feeding in the South.

In the past few years the South has awakened to her natural advantages for the production of live stock, and, where past generations exerted all of their energies toward the production of cotton, the present generation has wisely taken to diversified farming and live stock. The Southern Experiment Stations are largely responsible for this, for they have demonstrated without any possible doubt that cotton seed meal together with cotton seed hulls have a high value as a feed for beef production; nothing that we are able to grow in the north can equal it. The Texas Experiment Station has gone into this matter extensively, feeding cotton seed meal and hulls in different proportions to fattening steers, and have ascertained that the most economical way of feeding them to steers to obtain the largest gains, was by feeding 1 pound of cotton seed meal and 3 pounds of corn hulls, or in that proportion. Cattle in the South, however, that are fed extensively on cotton seed meal and hulls, are occasionally affected at the rainy seasons of the year with inflammation of the eyes, which at times terminates in the total loss of the sight. For this reason we strongly advise the provision of a larger variety of feeds; once or twice a week, perhaps, change from the cotton seed ration to one of the other standard grains that are available.

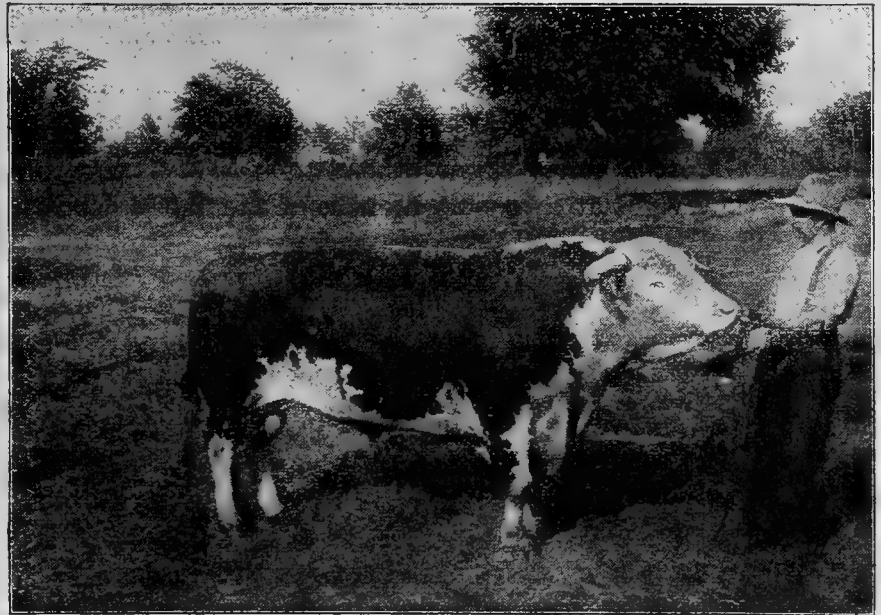


IMPORTED BRITISHER, No. 145096.
Record Breaking Champion of England and America.
Weight at 5 years, 2,835 Pounds.
Bred by A. E. Hughes, Leominster, England.
Owned by GILTNER BROS., Eminence, Ky.

Environment and Conditions.

Too much importance cannot be laid upon the the value of proper surroundings and correct methods during the fattening period. To feed and fatten steers economically, when the fattening period has once been thoroughly instituted, they should be provided with a good shelter to protect them, not only from the weather but also to give them a shelter from the hot sun and insects. The feed lot should be

comparatively small, restricting their exercise. The stockman must also remember that it is the greatest economy to push steers as rapidly as possible, as the longer the feeding period is drawn out the greater will be the expense. The gains made in the latter part of the feeding period cost comparatively much more for each pound than the earlier gains. Davis Stock Food has solved the problem of rapid feeding by inducing the steers to eat heartily at all times, keeping their appetite keen and at the same time so strengthen and tone up their digestive system that they are able to obtain the maximum of nutriment from the feed. Our contention cannot be any better demonstrated than by looking over the table of G. D. Gillett, who, in his own generation, was considered a king among feeders. We are indebted to Professor Henry, of the Wisconsin Experiment Station, for perpetuating this table in his book, "Feeds and Feeding." We copy it direct from this work.



PERFECTION, No. 92891.
 Owned by G. H. HOXIE,
 President Mallory Commission Company,
 Chicago, Ill.

Cost of Steer Twelve Months Old.

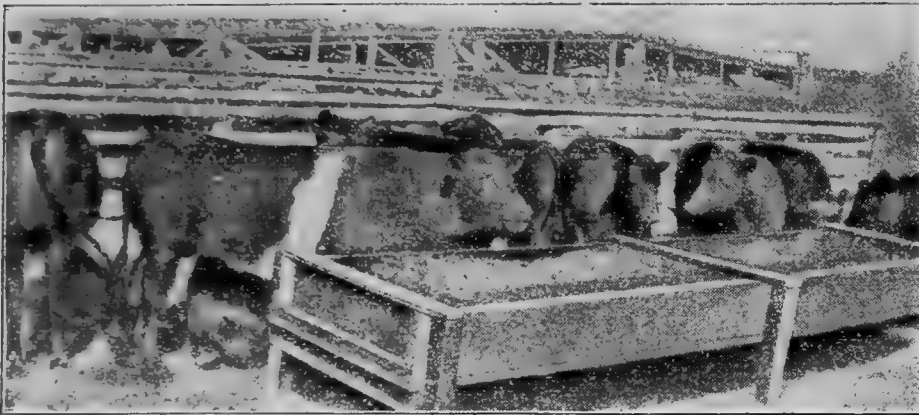
Value of calf at birth	\$ 3.00
Expenses of dam of calf, chargeable to calf for one year, as follows: 8 per cent interest on \$50.00, value of cow	4.00
Keep of yearling and feed of cow for twelve months	12.25
Insurance on cow	1.00
Risk of failure of cow to breed	1.75
Loss of calves by death, etc	1.00
(No corn fed up to twelve months.)	
Value of pasture and keep up to twelve months	6.00
Total	\$29.00
Weight of calf at twelve months of age, 700 pounds, at 5 cents	35.00
Profit at twelve months of age	\$6.00

Cost from Twelve to Twenty-Four Months of Age.

Value of steer at twelve months of age	\$35.00
Value of shock corn, 110 bushels, at 35 cents	38.50
Pasture, twelve to twenty-four months	3.00
Interest and risk	2.80
Total	\$79.30
Less 500 pounds pork, at 5 cents, made on droppings of steer	25.00
Net cost, twelve to twenty-four months	\$ 54.30
Weight of steer at twenty-four months of age, 1,600 pounds, at 6½ cents	104.00
Profit at twenty-four months of age	\$49.70

Cost from Twenty-Four to Thirty-Six Months of Age.

Value of steer at twenty-four months of age	\$104.00
Value of shock corn consumed in entire year, 125 bushels at 35 cents	43.75
Pasture, May 1st to November 1st	4.00
Interest and risk	8.32
Total	\$160.07
Less 500 pounds of pork at 5 cents, made on droppings of steer	25.00
Cost at thirty-six months of age	\$135.07
Weight at thirty-six months of age, 2,200 pounds, at 7 cents	154.00
Profit at thirty-six months of age	\$18.93



FIRST PRIZE WINNING CARLOAD OF DEHORND SHORTEORN CATTLE
at Fort Worth, Texas, Fat Stock Show, 1899.

Exhibited by M. SANSON,

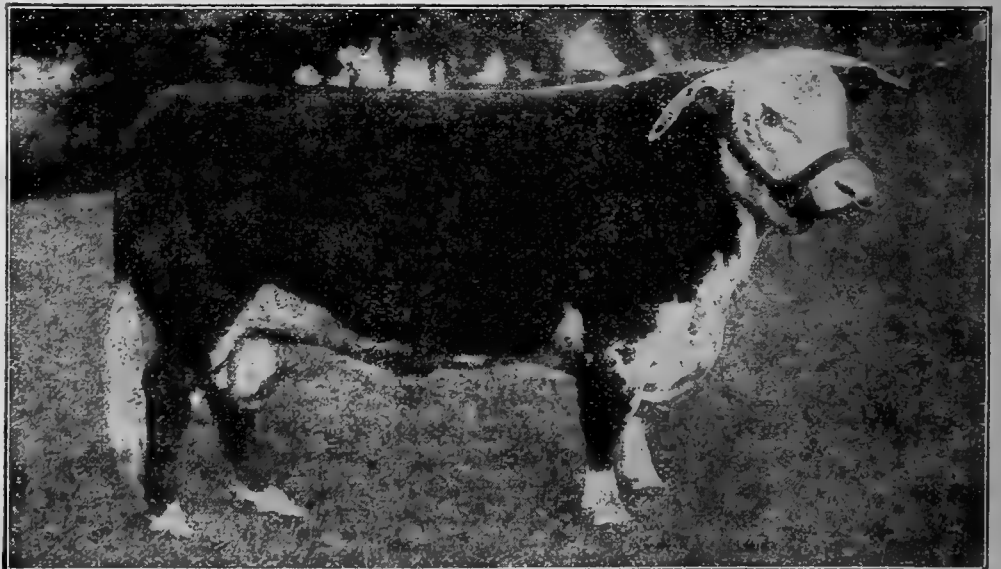
President Cassidy So. W. Commission Co.,
No. Fort Worth, Texas.

An additional argument for forced feeding can be found in the market. The time was, and not so very far back, when the farmer did not consider it advisable to fatten steers for the market under four years old, while the butcher of today demands what is practically baby beef. He wants his steer from one to two years old, ranging from 1,000 to 1,500 pounds in weight. The age is now counted in months instead of years. The high pressure feeding to obtain this kind of beef requires, of course, expensive feed, but from the price they bring, it pays in the long run.

The Feed Lot.

The feed lot should be high and dry and, above all, open. Sheds on the windward side, where the animals may lie in comfort, are recommended, and

the open lot to which the steers have access is much the best, even in winter. The feed rack should be built so that it is protected from winds and driving storms and constructed so that it can easily be filled from the wagon. Young animals should be fed at least three times a day, while through the latter part of the feeding period, morning and evening is sufficient for the concentrated feeds. Roughage or fodder should be in front of them at all times. When the steers are first placed in fattening, care should be taken to bring them on full feed



IMPORTED ALBANY.

Photograph Courtesy of FRANK B. HINES, Albion, Ill.

gradually, the time necessary varying from thirty to sixty days. A constant and plentiful supply of roughage will materially assist the inauguration. Once the feeding period is well under way, everything

should run with clocklike precision; the feeding in the morning and evening should be at the same regular hour so that the animal may know when to expect it, instead of running wildly about the lot every time the attendant comes into view. Kindness should be practiced, and the attendant who ill treats his charges should not be tolerated for a moment. The steers should have all the grain they will readily consume, but all remaining should be removed at once and fed to the hogs. The subsequent feeds should be reduced to just the amount they will eat up clean. The farmer must be careful not to overfeed his cattle, which, from a desire to push the feeding, he naturally is apt to do. Scouring should also be carefully watched, for a single day's scouring on the part of steers will knock off all the



IMPROVER (19206) No. 94020.

Bred by J. H. Arkwright, Hampton Court, Leominster, England.

Property of T. F. B. SOTHAM, Kankakee, Ill.

Improver was a winner at the Great American Shows and sire of many prize winners including the \$6,000 FULFILLER and the \$4,000 GOOD CROSS.

gains they have made in a week. Scouring is the result of a derangement of the digestive system, and the careful feeder will use Davis Stock Food to prevent it. Animals of the same size and strength should be fed from the same trough and at the same time. If there are in the bunch any animals which are smaller in size and weaker than their companions, they should be placed in separate lots so that they will get their full quota of grain without having to fight for it every step of the way. In the following tables we give eight different rations, together with the gains that each ration produced in actual feeding tests. These tests were conducted by the Ontario, Kansas, and Texas Experiment Stations, and are fairly representative.

ONTARIO AGRICULTURAL COLLEGE.

Roots and Barley.

	Pounds
Average weight of steers fed	1,061
Daily gain	2.14

Hay.....	12.
Roots	46.
Bran.....	5.
Barley.....	11.25

Roots and Corn.

	Pounds
Average weight of steers fed	1,106
Daily gain	2.31

Hay	9.5
Roots	34.
Bran	3.5
Corn	9.25

IOWA EXPERIMENT STATION.

Corn and Oil Meal.

	Pounds
Average weight of steers fed	1,340
Daily gain	2.8

Snapped corn	22.5
Corn meal	3.7
Oil meal.....	4.2
Hay.....	5.7

OREGON EXPERIMENT STATION.

Wheat and Silage.

	Pounds
Average weight of steers fed	847
Daily gain	2.

Chopped wheat.....	10.3
Clover hay.....	8.
Corn silage	18.

KANSAS EXPERIMENT STATION.

Balanced Ration.

	Pounds
Average weight of steers fed	1,083
Daily gain	2.4

Corn meal	10.
Shorts	5.
Bran.....	2.
Oil meal.....	4.
Tame hay.....	6.5

Corn and Stover.

	Pounds
Average weight of steers fed	1,211
Daily gain	1.7

Ear corn	26.7
Stover	5.

TEXAS EXPERIMENT STATION.

Cotton Seed Meal and Hulls.

	Pounds
Average weight of steers fed.....	638
Daily gain	1.76

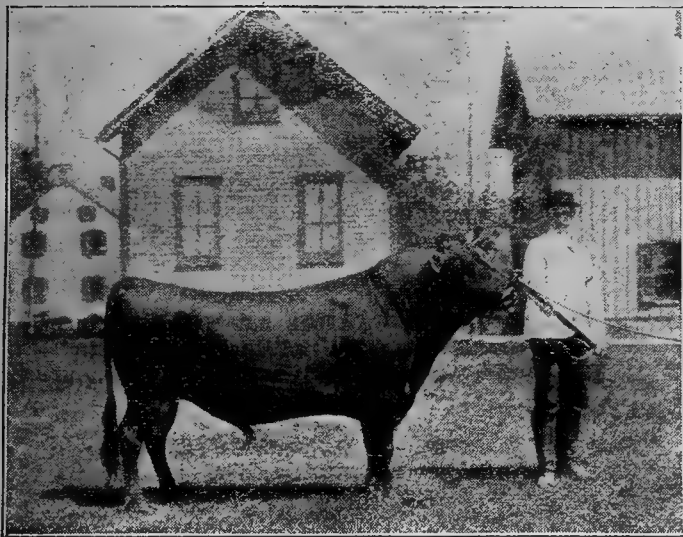
Cotton seed meal	5.
Cotton seed hulls	7.2
Corn silage	20.

Corn and Cotton Seed.

	Pounds
Average weight of steers fed	576
Daily gain	1.9

Corn	5.3
Cotton seed	5.2
Hay	5.3

DAIRYING.



**Champion Jersey Bull,
FLYING FOX.**
Owned by Dreamwold, the farm of
THOMAS W. LAWSON.
Geo. H. Pollard, Manager, Scituate, Mass.
Mr. Lawson paid \$7,500 for Flying Fox.

Jersey cattle are, as a whole, high strung and of a nervous temperament, making it imperative that they should receive good care. They cannot survive the abuse in treatment and feed that other breeds will stand fairly well. The cows are gentle and docile, but the bulls have the reputation of often being ugly and dangerous after two or three years' service. In breeding tests, conducted in various parts of the country, the Jerseys have always ranked well up but, strange as it may seem, have never been foremost, usually following the Shorthorns and Guernseys in total yield of butter fats during a certain period. They came out victoriously, however, in the competitive tests conducted at the World's Columbian Exposition in 1893. They produced more milk, more butter fat, more butter and cheese, making a higher net gain than any of the other breeds competing. Thus in test No. 1 (fifteen days' cheese test), the cow, Ida Marigold, No. 32615, produced 70.92 pounds of cheese, and Merry Maiden, No. 69449, produced 30.73 pounds of butter. In butter fats, Brown Bessie, No. 74997, produced 178.12 pounds in ninety days.

Jersey Cattle.

Jersey cattle have made the Island of Jersey (situated off the coast of France) famous. The breed has been kept pure and developed to the highest possible degree for a period dating back several centuries. In 1789 a law was passed forbidding the importation of foreign cattle to this island. Consequently all the resources of the island were drawn upon to develop the Jersey cattle to the highest possible degree.

Jersey cattle are preeminently milk and butter producers. Their milk, taken as a whole, is richer in butter fats than that of any other breed, although the quantity is somewhat less than several of the other dairy breeds, and it has been the sole purpose of the breeders of Jersey cattle to develop their butter fat producing qualities to the highest degree, all other points in their breeding being merely incidental.



Prize Winning Jersey Cow, FIGGIS, No. 76106

50 pounds 7 ounces milk in one day. 329 pounds 4 ounces milk and 19 pounds 15 ounces butter in 7 days. 649 pounds 6 ounces milk and 38 pounds 10 ounces butter in 14 days. 1,421 pounds 7 1/2 ounces milk and 82 pounds 9 1/2 ounces butter in 31 days. 7,444 pounds 1 ounce milk and 472.95 pounds butter in 1 year. 13,465 pounds 3 ounces milk and 862.16 pounds butter in 2 years. 19,451 pounds 11 ounces milk and 1,235.55 pounds butter in 3 years. 25,172 pounds 3 ounces milk and 1,593.30 pounds butter in 4 years.
In six months after dropping calf she gave 7,442 pounds 4 ounces milk, testing 448 pounds butter. Winner at numerous State Fairs, and winner of following at World's Fair, St. Louis, 1904: Cow, 3 years old and over, 1st prize. Cow, 2 years old and over, championship. Jersey cow or heifer, any age, grand championship. In aged herd, headed by Flying Fox's Foxhall, with Blue Bell's Handsome Bell, Fox's Triple Rose O'Dreamwold and King's Figgis O'D, won fourth.

Owned by Dreamwold, the farm of **THOMAS W. LAWSON.**
Geo. H. Pollard, Manager, Scituate, Mass.

Guernsey Cattle.

- This breed, like the Jerseys, took their name from an island known as the Island of Guernsey. They typify the theory of adaptability, for the Island of Guernsey is cut off from the mainland by little strips of the sea. It is protected on all sides by a rough and rocky coast, and the characteristics of the country have played an important part in molding the character of the Guernsey cattle of today. The people of the Island of Guernsey have for years labored carefully in order to produce a cow that would excel in butter production, and the Guernsey is the result. They are known the world over for producing butter of the highest natural color at the smallest cost. Like those of the Island of Jersey, the inhabitants were jealous of their cattle, and in 1789 took measures to prevent the importation of stock. In 1826 they went further and absolutely prohibited importation, except for slaughtering.

The most striking characteristic of the Guernsey is her rich, mellow skin. In appearance they are finely built, with big bodies, a particularly gentle, quiet temperament, and wholly free from nervousness.



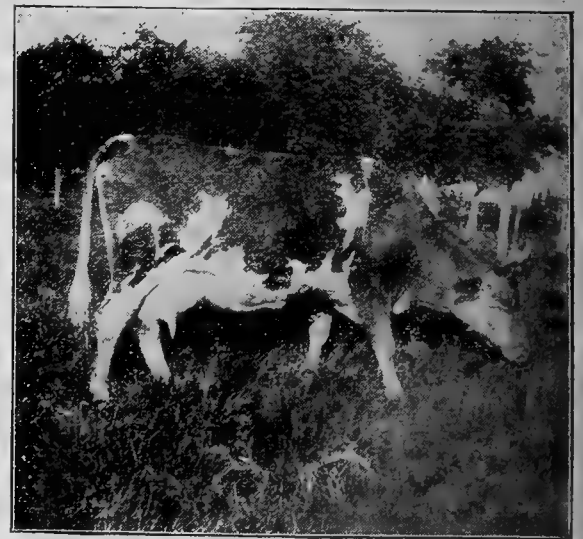
Guernsey Cow,
IMP. RED ROSE OF SEAGROVE,
Champion Aged Cow at Pan-American,
Buffalo, 1901.

them and distributed them at a public sale to dairymen of that state. They very rapidly gained in favor, and in 1877 the American Guernsey Cattle Club was organized in New York City. There were at that time about 150 pure bred Guernseys in this country. From then on up to the present time the interest in the Guernseys has steadily increased until there are now about 20,000 pure bred animals in the registry. The Guernseys have never posed to any extent as record breakers, but have quietly maintained their usual high average. Lily of Alexandria, No. 1059, made a phenomenal showing many years ago in producing 12,855½ pounds of milk in one year, which, at two months before calving time, tested 7.2 per cent butter fats. This will give a fair illustration of the capabilities of the Guernseys.



Guernsey Bull, **ROBIANOS STANDARD, No. 7254.**
Grand Champion at Illinois State Fair.
First and Grand Champion at National Dairy Show,
Chicago, 1906.
Owned by
M. D. CUNNINGHAM
Kansasville, Wis.

The prevailing color is a delicate fawn with white markings and a cream colored nose. They have a rich golden color around the eye, on the udder and teats, at the base of the horns and tail. The Guernsey has always been preeminently a family cow. Around 1870 the Massachusetts Society for the Promotion of Agriculture imported a number of



Prize Winning Guernsey Cow,
MARY MARSHAL, No. 5604.
Owned by
EZRA MICHENER,
Carversville, Pa.

Holstein Frisian.

These cattle are the American representatives of the natives of the lower ridges of Belgium, Holland and northwestern Germany. Their origin is ascribed to the Frisians, a tribe of people mentioned in Roman histories, before the opening of the Christian era, as peaceable cattle breeders on the shores of the North Sea. The pure bred cattle of the American herd books are black and white, while the European



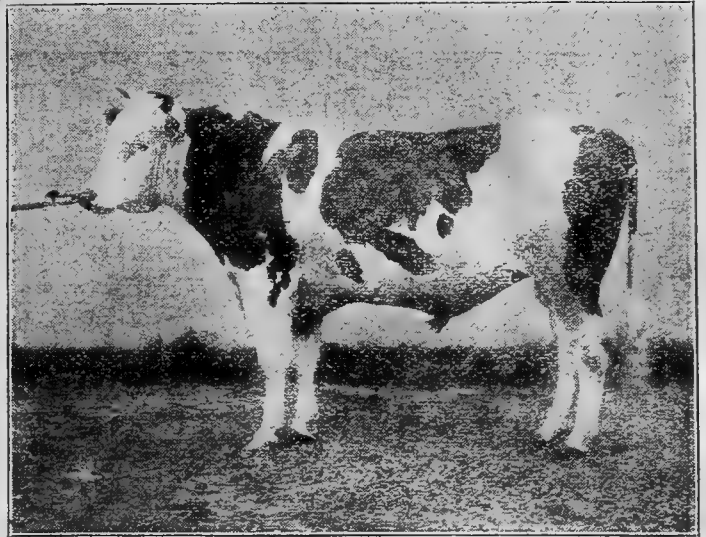
A Prize Winning 4 Year Old Son of
COUNT PAUL DE KOL.
Owned by F. P. KNOWLES,
Worcester, Mass.

of the cow is around 1,200 pounds. They grow very rapidly and mature early; if conditions are

herd books will allow red and white, gray and white, or mouse color and white. These cattle are of what is technically called the milk and beef form. The average weight

favorable, in from two to two and one-half years. The cows take

on flesh very rapidly and make veal of unsurpassed quality. Among their most prominent characteristics is their phenomenal constitution and vigor, possibly the highest and strongest among all the dairy breeds. Their milk and butter fat producing qualities are very satisfactory and they will, under proper treatment, produce an average of 15 pounds of butter fat a week.



Holstein Frisian Bull,
BERNARDE TULA DE KOL.
Sweepstake Winner, Pan-American.

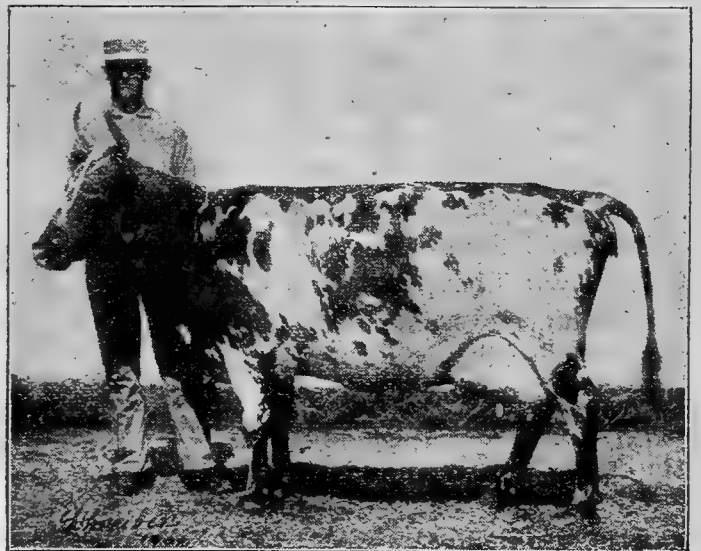


Champion Holstein Frisian Bull,
PAUL BEETS DE KOL.
Owned by T. A. MITCHELL, Weedsport, N. Y.

Ayrshire.

The Ayrshire cow is a native of the county of Ayr, in Scotland. The first importation was made into Canada and New England. They were subsequently sent to the South, as it is claimed that they endure the heat better than any other breeds. The Canadians, however, also claim that they endure the cold climate of that country better than any other breeds.

The cows are of medium size, averaging perhaps 1,000 pounds. They are of stocky build with short legs and are usually spotted in color. Their constitution is strong and they seem to have the faculty of getting along remarkably well by "hustling" their own feed, much better than any of the other breeds that have so far been considered. The average yearly yield in milk is approximately 6,000 pounds, under ordinary care, although there are individual cows having records up to 12,000 pounds a year. There has never been any attempt to develop the butter producing quality in the Ayrshire, although she is well adapted for this purpose and it would be a comparatively easy matter to develop her along this line.



Ayrshire Cow,
VIOLA DRUMMOND.
First Prize, Pan-American Exposition, 1901.

Shorthorns as Dairy Cows.

Soon after the Revolutionary War pure bred Shorthorns were imported into Virginia. They were extremely well thought of at that time. They are in every sense of the word a cow of dual worth, supplying milk in abundance and at the same time maintaining the beef qualities. At the test made at the Columbian Exposition in 1893 they made a phenomenal showing under extremely unfavorable circumstances, unfavorable because no opportunity was given to select the best cows for this purpose.



Grade Holstein-Guernsey Cow.

3,679.8 pounds of milk; the champion Jersey, Brown Bessie, 3,634 pounds of milk, and the champion Guernsey, Materna, 3,548.8 pounds of milk. In test No. 3, for butter, the champion Jersey cow, at a cost of \$8.57, produced, net, \$24.69 worth of butter; the champion Shorthorn cow, at a cost of \$8.18, produced, net, \$19.57 worth of butter, and the champion Guernsey, at a cost of \$5.57, produced, net, \$19.37 worth of butter. In test No. 4, for heifers, seven Jerseys cost \$34.43 for feeding, and netted \$57.27; six Shorthorns cost \$23.52 for feeding, and netted \$47.42. Therefore, taken all in all, it will be seen that the Shorthorns compare favorably with their competitors, even in the capacity of dairy cows, while, if we credit the Shorthorns with their value as beef producing animals, they are far ahead.

Red Polled Cattle.

The modern Red Polled cattle originate from the hornless or polled cattle of England. The modern breeder has endeavored to produce a cow of medium size, blood red in color, of fine bone and compact form, hardy, docile, easily fattened and with a good flow of fairly rich milk

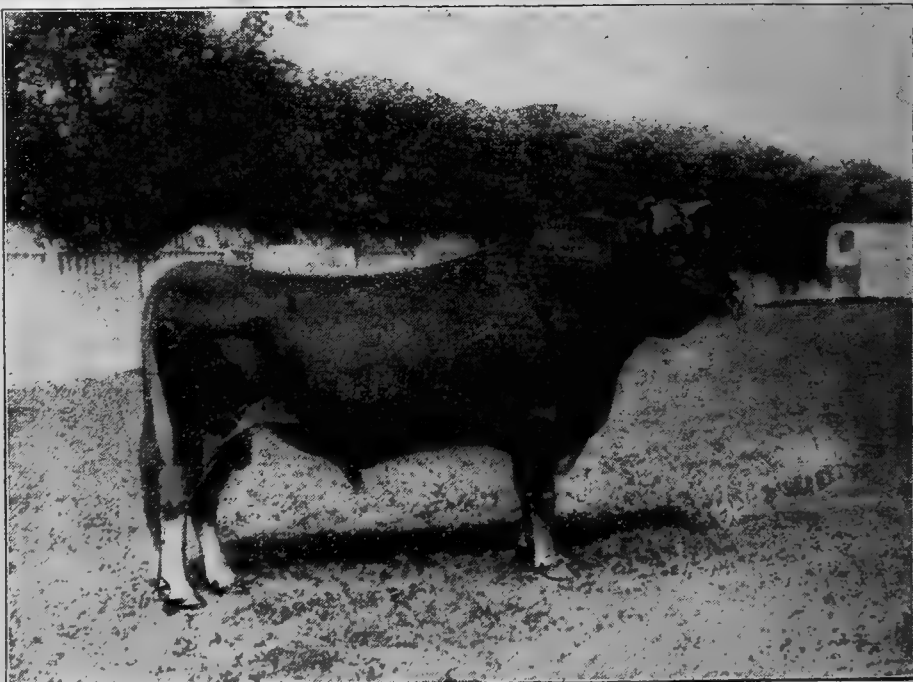
Instead of following this method cows were picked haphazard and consequently were rarely as good as they might have been, if secured through a more careful selection. But in spite of those disadvantages the Shorthorns held their own and more. In test No. 1, for cheese, there were twenty-five cows of each breed. The result follows:

Jerseys	906.1 lbs.
Shorthorns	905.5 lbs.
Guernseys	871.9 lbs.

In the second test (ninety days) for butter, loss and gain in live weight where maintenance was counted for or against the cows, the net gain was as follows:

Jerseys, twenty-five cows	\$1,323.21
Guernseys, twenty-five cows	977.63
Shorthorns, twenty-four cows	911.13

To produce these results cost the Jerseys, twenty-five cows, \$587.87; the Shorthorns, twenty-four cows, \$506.50; and the Guernseys, twenty-five cows, \$487.25. The champion Shorthorn, Nora, gave



CZAR OF RIVERMEADOW.
Champion Jersey Bull heading the Dotshome Dairy Herd.
Owned by F. E. DOWLEY, Fayetteville, N. Y.

the year around; in other words, to produce a cow generally suited to the wants of the farmer. It is admitted that the Red Polled will not compare with the best Jerseys and Holsteins, etc., in the flow of milk or yield of butter, nor does the steer take the front rank as a beef animal; however,

looked at from every side, they adapt themselves well to the purpose of the farmer and have much to commend them. Forty to 50 pounds of milk a day is a fair average for a good Red Polled cow, and she will easily give 6,000 or even 9,000 pounds a year if properly fed and cared for, with butter fat running at an average of 4 per cent. Mature Red Polled cows in breeding condition will average 1,200 to 1,400 pounds in weight, and bulls 1,800 to 2,000 pounds.

Devon Cattle.

The Devons are the oldest of the English breeds, being natives of Devonshire, in the southwestern part of England. In England they are extremely well thought of for their beef qualities, while they produce from 15 to 25 pounds of butter a week under proper man-

agement. The ordinary farmer should have no difficulty in averaging a pound of butter a day from them, while they will yield on an average two gallons of milk a day. The cattle are very active and hardy; they adapt themselves readily to a dry, mountainous country; the bulls are intelligent and quiet, obtaining a weight of from 1,800 to 2,000 pounds in four years. The digestive and assimilative powers of the cows are better than the ordinary.

These cattle are natives of Holland, dating back to the 17th century.

They are peculiar, inasmuch as they invariably have a broad, white band running entirely around the center of the body; they are white headed and usually have a black ring around each eye and a full white tail. These cattle are strictly a dairy breed being large in the production of milk. The cows range from 800 to 1,200 pounds in weight, while the bulls range from 1,800 to 2,200 pounds. There are a great many of these cattle in the New England States. They are splendid milk producers, and their adherents are enthusiastic in their praise.



PRIMROSE'S TRICKSEY
A Prize Winning Guernsey.
Owned by **ROSENDALE GUERNSEY HERD,**
Chas. L. Hill, Proprietor,
Rosendale, Wis.



PRIMROSEDALE.
A Prize Winning Guernsey Cow who has a Record of
576.75 pounds of Butter Fat a Year.
Owned by **ROSENDALE GUERNSEY HERD,**
Chas. L. Hill, Proprietor,
Rosendale, Wis.



Undeclared 1903 Champion Polled Durham Bull.
GOLDEN HERO, No. 150363.
 Owned by **WOODSIDE FARM**,
 Pendleton, Ind.

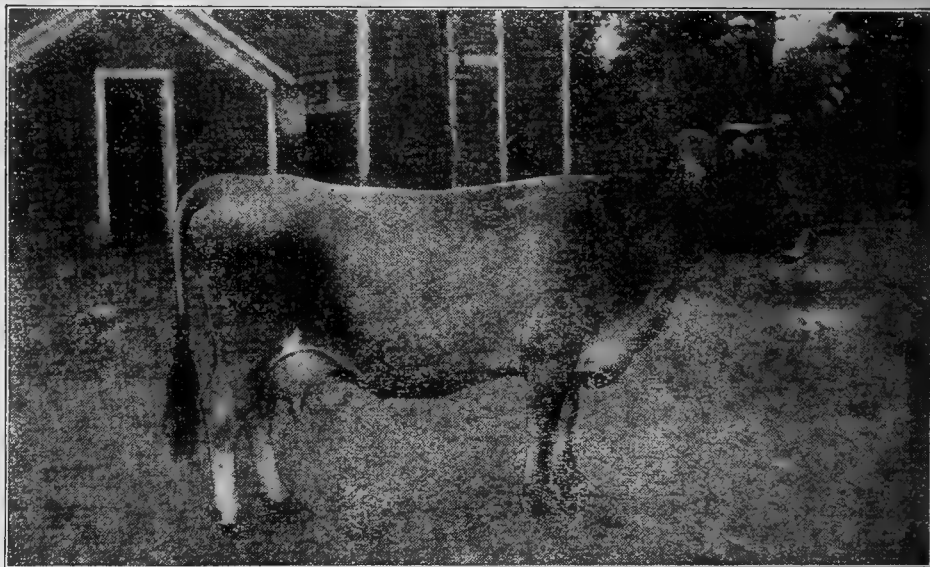
Fat Stock Show; in 1891, gave 245 pounds of milk, containing 9.32 pounds of butter fat, in three days, yielding during one day of the test, $3\frac{1}{4}$ pounds of butter fat, the largest daily production of butter fat ever recorded by any one breed up to that time. The milk is very desirable for family use, and with ordinary care each cow will produce from 20 to 30 quarts of milk a day. They make fine beef and veal. The cows are persistent milkers.

Selection.

From the brief descriptions in the foregoing pages the farmer will gain some idea of the various important points which go to

Brown Swiss Cattle.

Brown Swiss cattle were first brought to this country in 1869. Their characteristics are as follows: Large size, firm form, color ranging from dark brown to a chestnut brown, a tuft of hair between the horns and on the inside of the ear, and a narrow line along the back, generally light. The horns are short and waxy, with black tips, nose black, white thighs and heavy quarters, switch, hoofs and tongue black; straight hind legs. The cow often weighs as much as 1,600 pounds; the bulls average 2,000 pounds. The calves are large, sometimes weighing 100 pounds when dropped. They mature quickly, have hearty constitutions and give generous returns with proper care for the time and money expended on them. A cow at the Chicago



ANNIE DARLING 3rd.
 A Champion Brown Swiss Cow.
 Owned by
HULL BROS.,
 Painesville, Ohio, R. F. D. No. 1.

NOTE—This picture taken $8\frac{1}{2}$ months after calving.



LORETTA D.
 1st Prize, Butter Test,
 St. Louis, 1904.

make up the modern dairy cow. On the whole, a good dairy cow should give at least 5,000 pounds of milk during the period of lactation. This will interest the farmer or dairyman if he is going to produce milk for the market. If, however, he is looking for butter fats, he should gauge his cows by this standard, and a cow producing 250 pounds of butter fats during the lactation period would be a very fair average. When it is taken into consideration that a cow, whose milk tests 4 per cent, must give on an average 25 pounds or 3 gallons almost every day in the year, the profitable dairy cow should maintain her flow of milk practically

the entire year. It therefore behooves the dairyman to see that his cows are kept in the best possible physical condition, that their digestive organs are working properly, and that their blood is kept pure and free from disease. If Davis Stock Food is being fed regularly he will have but little difficulty in doing this, and will, at the same time, obtain surprising results in maintaining a continuous flow of milk, rich in butter fats. It

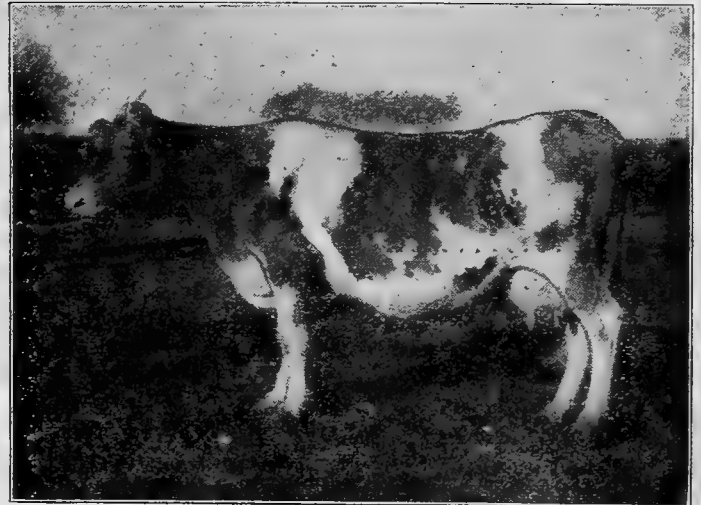


Prize Winning Jersey Cow.
IDA OF ST. LAMBERT, No. 24990.
Owned by
MILLER & SIBLEY,
Franklin, Pa.

will not only amply repay him for its use in actual dollars and cents, but insure the continued good health of the herd, something that is all im-

portant. Many cows that are only common or ordinary producers, can be made to give a more profitable yield by the judicious and constant use of Davis Stock Food, because of the fact that they have been hampered in many cases by improper digestion and assimilative

powers; and it goes without saying that if a cow cannot extract the nutritive properties of the feed she eats, she will not be able to produce a profitable amount of milk and butter fats. We reproduce on the following page a table giving the results of tests conducted by the various experiment stations in the United States. It must be understood, of course, that the cows used for these tests were



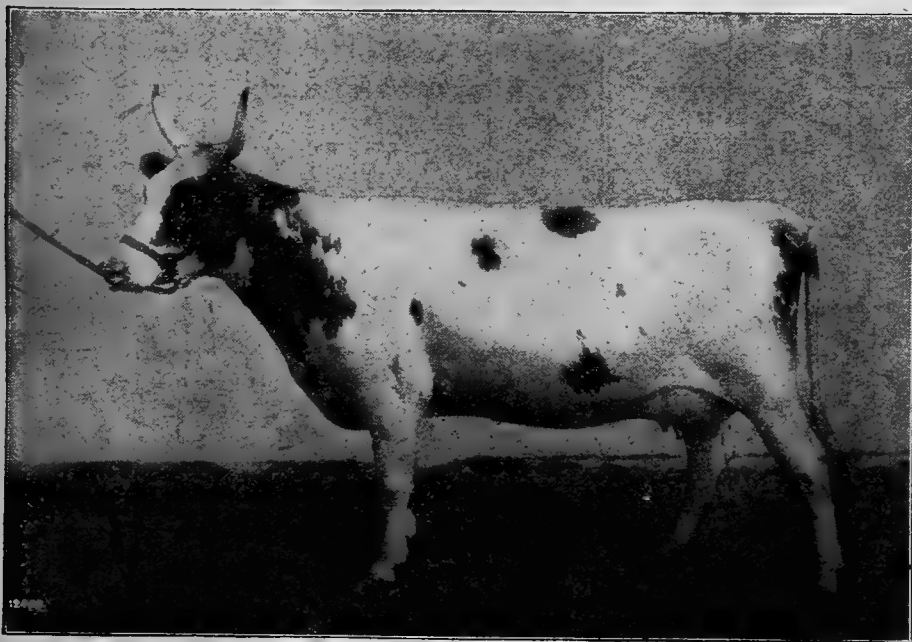
BELLE BRANDON,
A 16-Year Old Guernsey that is Making
a Record for Herself.
Owned by Rosendale Guernsey Herd.
CHAS. L. HILL, Proprietor,
Rosendale, Wis.



Another Prize Winning Jersey Cow.
MATILDA 4th, No. 12816.
Owned by
MILLER & SIBLEY,
Franklin, Pa.

the best of their respective breeds, and a close study of the table will enable the breeder to deduct some interesting facts relative to his own herd.

Davis Stock Food exerts a special action on the mammary glands greatly increasing both the quality and quantity of the milk and we want you to try it.



CROFTJANE DINAH 19th.
A Champion Ayrshire Cow.
Owned by
W. P. SCHANCK,
Avon, N. Y.

Results of Tests of Dairy Breeds Conducted by American Agricultural Breeding Stations.

BREED	Number of Cows Included	Number of Lactation Periods	Average Yield per Lactation Period		Average Per Cent Fat	Average Cost of		
			Milk, Pounds	Fat, Pounds		Food Eaten Per Day, Cents	Producing 100 pounds Milk, Cents	Producing 1 pound Fat, Cents
New York (Geneva).								
Jersey	4	11	5,045	282.1	5.60	12.4	90	16.1
Guernsey	4	6	5,385	285.5	5.30	12.5	86	16.1
Holstein	4	4	7,918	266.1	3.36	13.9	65	19.1
Ayrshire	4	12	6,824	244.8	3.60	13.5	74	20.2
Shorthorn	1	2	6,055	269	4.44	12.7	78	17.2
Devon	3	5	3,984	183.3	4.66	10.3	94	20.5
American.								
Holderness	2	4	5,721	213.1	3.73	12.2	76	20.1
Maine.								
Jersey	2	4	5,460	297	5.50	61.2	113	20.4
Holstein	2	3	8,369	285	3.47	19.5	85.2	25.2
Ayrshire	2	4	6,612	233	3.67	17.1	94.9	26.8
New Jersey.								
Jersey	3	3	7,695	376.3	4.89	16.1	87.1	17.9
Guernsey	4	4	7,446	379	5.09	14.9	78.1	15.3
Holstein	3	3	8,455	300.2	3.55	19.3	79.3	22.4
Ayrshire	4	4	7,461	275.3	3.69	15	76	20.6
Shorthorn	3	3	10,457	396.3	3.79	15.4	79.2	20.6
Total	45	72						

Averages for all Breeds and Lactation Periods.

BREED	Number of Cows Included	Number of Lactation Periods	Average Yield per Lactation Period		Average Per Cent Fat	Average Cost of		
			Milk, Pounds	Fat, Pounds		Food Eaten per Day, Cents	Producing 100 pounds Milk, Cents	Producing 1 pound Fat, Cents
Jersey	9	18	5,579	301.1	5.40	13.9	94.7	17.4
Guernsey	8	10	6,210	322.9	5.20	13.5	82.8	15.8
Holstein	9	10	8,215	282	3.43	17.2	74.7	61.5
Ayrshire	10	20	6,909	248.5	3.60	14.5	78.5	21.5
Shorthorn	4	5	8,696	345.4	3.97	14.3	78.7	19.4
Devon	3	5	3,984	183.3	4.60	10.3	94	20.5
American Holderness	2	4	5,721	213.1	3.73	11.2	76	20.1
Total	45	72						

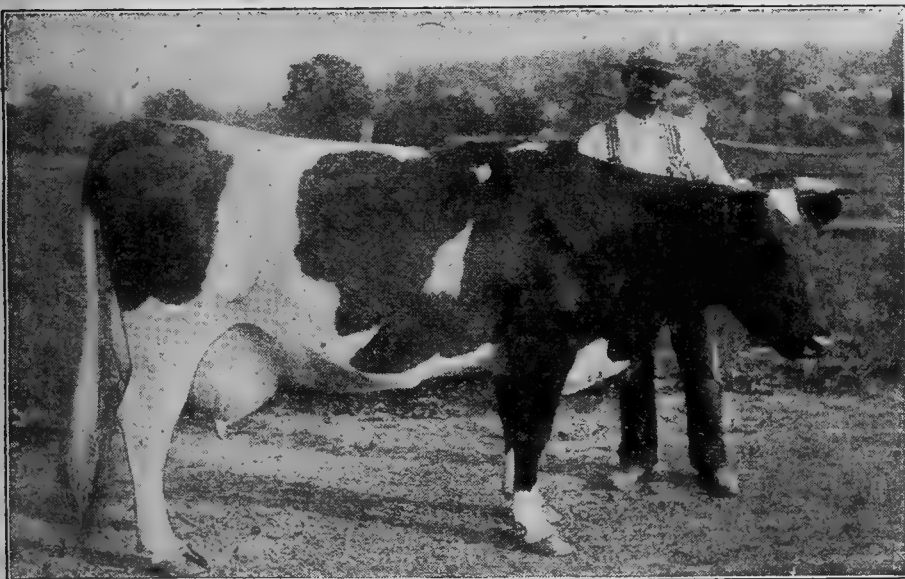


FIFTY DAIRY RULES.

United States Department of Agriculture.

1. Observe and enforce the utmost cleanliness about the cattle, their attendants, the stable, the dairy and all utensils.

2. A person suffering from any disease, or who has been exposed to a contagious disease, must remain away from the cows and the milk.



Holstein Friesian Cow.
CYBELE, No. 5291 H. H. B.

Record { 100½ pounds Milk in One Day.
13,031 pounds 14 ounces Milk in One Year.
15 pounds 8 ounces Butter in Seven Days.

Imported by **EDGAR HUIDEKOPER, Meadville, Pa.**

3. **The Stable.** Keep dairy cattle in a room or building by themselves. It is preferable to have no cellar below and no storage loft above.

4. Stables should be well ventilated, lighted and drained; should have tight floors and walls and be plainly constructed.

5. Never use musty or dirty litter.

6. Allow no strong smelling material in the stable for any length of time. Store the manure under cover outside the cow stable, and remove it to a distance as often as practicable.

7. Whitewash the stable once or twice a year; use land plaster in the manure gutters daily.

8. Use no dusty, dry feed just previous to milking; if fodder is dusty, sprinkle it before it is fed.

9. Clean and thoroughly air the stable before milking; in hot weather sprinkle the floor with Davis Stable Disinfectant.

10. Keep the stable and dairy room in good condition, and then insist that the dairy factory, or place where the milk goes, be kept equally well.

11. **The Cows.** Have the herd examined at least twice a year by a skilled veterinarian.

12. Promptly remove from the herd any animals suspected of being in bad health, and reject her milk. Never add an animal to the herd until certain it is free from disease, especially tuberculosis.

13. Do not move cows faster than a comfortable walk while on the way to the place of milking or feeding.

14. Never allow the cows to be excited by hard driving, abuse, loud talking or unnecessary disturbance; do not expose them to cold or storms.

15. Do not change the feed suddenly.
16. Feed liberally, and use only fresh, palatable feedstuffs; in no case should decomposed or moldy material be used.
17. Provide water in abundance, easy of access and always pure; fresh, but not too cold.
18. Salt should always be accessible.
19. Do not allow any strong flavored food, like garlic, cabbage or turnips to be eaten, except immediately after milking.
20. Clean the entire body of the cow daily. If hair in the region of the udder is not easily kept clean, it should be clipped.
21. Do not use the milk within twenty days before calving, nor for three to five days afterward.
22. **Milking.** The milker should be clean in all respects; he should not use tobacco; he should wash and dry his hands just before milking.

23. The milker should wear a clean outer garment, used only when milking, and kept in a clean place at other times.

24. Brush the udder and surrounding parts just before milking, and wipe them with a clean, damp cloth or sponge.

25. Milk quietly, quickly, cleanly and thoroughly. Cows do not like unnecessary noise or delay. Commence milking at exactly the same hour in the morning and evening, and milk the cows in the same order.

26. Throw away (but not on the floor, better in the gutter) the first few streams from each teat; this milk is very watery and of little value, but it may injure the rest.

27. If in any milking a part of the milk is bloody, stringy or unnatural in appearance, the whole mass should be rejected.

28. Milk with dry hands; never allow the hands to come in contact with the milk.

29. Do not allow dogs, cats or loafers to be around at milking time.

30. If any accidents occur by which a pail full or partly full of milk becomes dirty, do not try to remedy this by straining, but reject all this milk and rinse the pail.

31. Weigh and record the milk given by each cow and take a sample morning and night, at least once a week, for testing by the fat test.

32. **Care of Milk.** Remove the milk of every cow at once from the stable to a clean, dry room where the air is pure and sweet. Do not allow cans to remain in stables while they are being filled.



Holstein Friesian Bull.
JEWEL OF HOME FARM.
"A Champion in his Class."

Owned by W. B. BARNEY & CO., Hampton, Ia.

33. Strain the milk through a metal gauze and a flannel cloth or layer of cotton as soon as it is drawn.
34. Aerate and cool the milk as soon as strained. If an apparatus for airing and cooling at the same time is not at hand, the milk should be aired first. This must be done in pure air, and it should then be cooled to 45 degrees, if the milk is for shipment, or to 60 degrees if for home use or delivery to a factory.
35. Never close a can containing warm milk which has not been aerated.
36. If cover is left off the can, a piece of cloth or mosquito netting should be used to keep out insects.
37. If milk is stored it should be held in tanks of fresh, cool water, renewed daily, in a clean, dry, cold room. Unless it is desired to remove cream, it should be stirred with a tin stirrer often enough to prevent forming a thick cream layer.
38. Keep the night milk under shelter so rains cannot get into the cans. In warm weather hold it in a tank of fresh cold water.
39. Never mix fresh, warm milk with that which has been cooled.
40. Do not allow the milk to freeze.
41. Under no circumstances should anything be added to milk to prevent its souring. Cleanliness and cold are the only preventives needed.
42. All milk should be in good condition when delivered. This may make it necessary to deliver twice a day during the hottest weather.
43. When cans are hauled far they should be full and carried in a spring wagon.
44. In hot weather, cover the cans when moved in a wagon, with a clean, wet blanket or canvas.
45. **The Utensils.** Milk utensils for farm use should be made of metal and have all joints smoothly soldered. Never allow them to become rusty or rough inside.
46. Do not haul waste products back to the farm in the same cans used for delivering milk. When this is unavoidable, insist that the skim milk or whey tank be kept clean.
47. Cans used for the return of skim milk or whey should be emptied and cleaned as soon as they arrive at the farm.
48. Clean all dairy utensils by first thoroughly rinsing them in warm water; then clean inside and out with a brush and hot water in which a cleaning material is dissolved; then rinse, and lastly sterilize by boiling water or steam. Use pure water only.
49. After cleaning, keep utensils inverted in pure air and sun if possible, until wanted for use.
50. **Feed Davis Stock Food every day.**



BUTTER GRADING.

The following information will prove interesting to the dairyman and farmer's wife alike, as it will inform them regarding the market records of their product and how they are classed:

Analyses of Foreign Samples of Butter.

(In Per Cent).

A. Salted Butter.

Country	No. of Analyses	Water	Fat	Curd	Ash (Salt)
Denmark.....	55	12.86	83.78	1.21	2.15
Sweden.....	139	14.13	82.57	.98	2.32
Finland.....	2	13.05	84.11	1.58	1.26
Netherlands.....	4	12.97	84.13	1.39	1.51
France.....	235	13.32	84.48	1.43	.77
Great Britain.....	322	12.09	84.66	1.14	2.11
Germany.....	162	13.38	83.70	1.22	1.67
Italy.....	6	11.52	85.56	1.07	1.86
Australia.....	59	11.16	85.32	.96	2.56
Canada.....	207	8.97	84.29	1.44	5.17
United States.....	473	11.44	84.64	1.02	2.90

B. Unsalted Butter.

France.....	58	13.73	85.80	1.39	.08
Germany.....	86	12.03	85.70	2.15	.12
Great Britain.....	24	13.43	85.64	.80	.13
Austria.....	5	14.15	84.14	1.54	.17
Italy.....	53	13.67	85.08	1.11	.15
Switzerland.....	14	13.76	84.65	1.55	.04
Australia.....	2	10.63	87.71	1.39	.28
Average for salted butter.....	1,676	11.95	84.27	1.26	2.58
Average for unsalted butter.....	242	13.07	85.24	1.57	.13

TWELVE CAUSES OF TAINTED MILK.

1. Poor, decayed fodders or irrational methods of feeding.
2. Poor, dirty water used for drinking water or for the washing of utensils.
3. Foul air in cow stables, or the cows lying in their own dung.
4. Lack of cleanliness in milking; manure particles on udder.
5. Keeping the milk too long in warm, poorly ventilated and dirty places.
6. Neglecting to cool the milk rapidly, directly after milking.
7. Lack of cleanliness in the care of the milk, from which cause the greater number of milk taints arise.
8. Poor transportation facilities.
9. Sick cows, udder diseases, etc.
10. Cows being in heat.
11. Mixing fresh and old milk in the same can.
12. Rusty tin pails and tin pans. (Boggild).

MILK—ITS PRODUCTION.

The production of milk has been reduced to a science. Its secretion in the cow is unparalleled as an example of the rapid and extensive transformation of the raw feed products into animal compounds. It is certain that the successful feeding of milch cows requires perhaps a greater understanding and wider knowledge of the facts pertaining to it than any other department of animal husbandry. It is essential, therefore, that the dairyman and farmer should become familiar with the pertinent points of the art.

Milk is extracted from the system by the mammary glands, which in the cow are known as the



Holstein Friesian Cow.
DAISY FISCHER, No. 49379, H. F.
341.3 lbs. Milk } in 7 Days as
13.60 lbs. Butter } a 3-Year-Old.

Owned by W. B. SMITH & SONS, Columbus, Ohio.



Holstein Friesian Cow.
VELOX, No. 56733, H. F.
409 lbs. Milk } In 7 Days at
18.90 lbs. Butter } 4 Years Old.

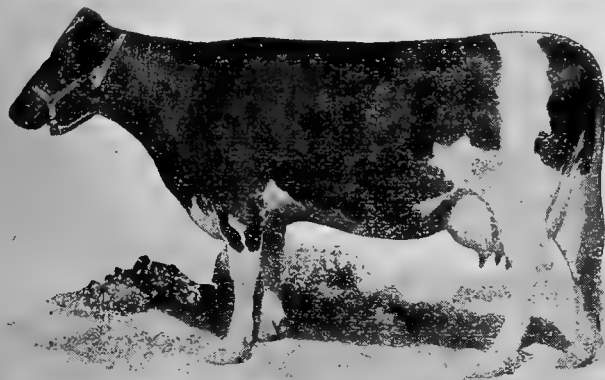
Owned by W. B. SMITH & SONS, Columbus, Ohio.

udder. It is made up of water and solids, the solids composed of mineral compounds, proteids, fats and sugar. The average composition of a normal cow's milk is as follows:

Total Solids, Per Cent	Ash, Per Cent	Proteids, Per Cent	Fats, Per Cent	Sugar, Per Cent	Water, Per Cent
12.9	7	3.2	3.9	5.1	87.1

It goes without saying that there is a large variation in the composition of cows' milk, taken from different animals, or from

different herds, or under different conditions.



Holstein Friesian Cow.
ADVENTURESS 3d's BEAUTY, No. 42283, H. F.
411.9 lbs. Milk } In 7 Days as
14.11 lbs. Butter } a 3-Year-Old.

Owned by W. B. SMITH & SONS, Columbus, Ohio.

The actual secretion of milk and the manner in which it is brought about is something that we are more or less in the dark about, and it after all makes comparatively little difference so long as we obtain results. On the other hand the source of the constituents in the various feeds is something of immense importance, and fortunately we have more or less definite information on it.

Secretion.

The constituents which go to make up milk, as they appear in milk, will not appear in that form in the raw material or feeds. These feeds, however, do contain certain nutrients which, subjected to the vital processes in the animal's body, are transferred into the constituents of milk. The mammary glands are not simply a sieve or filter whose function it is to strain the blood, as it were, but constitute a special tissue in which wondrous and extensive chemical changes take place. Here in the animal body, for instance, we first find casein and the mixture of compounds known as butter fats; we also find the sugar, unlike any that is found in plants or any other part of the animal organism.

Source.

From the information we have on the various feedstuffs and their composition, compared with that of milk, it is clear that the proteids of the milk can have but one source, namely, the proteids of the feed, and it seems quite certain that the proteids of the milk are the only components of the milk which have their origin exclusively in the feed proteids. And we have every reason for believing that milk, sugar and butter fats are constructed, in a part at least, from the carbohydrates of the feed. The New York Agricultural Experiment Station conducted an investigation with two cows to ascertain, if possible, the source of butter fats. Under the experiments, which lasted considerably over two months, both the cows gained in weight and produced respectively 19 pounds and 14 pounds more of butter fats than can be accounted for from the available fat and proteids of the feed. The conclusion was drawn, therefore, that these constituents were derived from the carbohydrates. It can-



**Holstein Friesian Cow, No. 31894, H. F.
Member of Grand Sweepstakes Herd Winning Silver
Cup at Ohio State Fair, 1902.**

**Owned by
W. B. SMITH & SONS,
Columbus, Ohio.**



**Holstein Friesian Cow.
PAYNES LADY DEVRIES, of Rochester 2d, No. 32883, H. F.
569.6 lbs. Milk } In 7 Days.
21.37 lbs. Butter }
Winner of Two Silver Cups at Ohio State Fair, 1902.
Owned by
W. B. SMITH & SONS,
Columbus, Ohio.**

not, however, be asserted positively that the ingested fats did not pass directly into the milk.

We do not look with any great wonder upon a cow yielding a total of 6,000 pounds of milk per year. Stop a minute, however, and reflect upon what this means. Nothing more or less than that the animal's production of milk solution is approximately 800 pounds of milk solids, an amount at least double the dry matter in the body of a cow weighing 900 pounds. When we stop and consider that the mixture of this new material is carried on, not only for a single day, month or year, but throughout the entire life of the animal, we can gain some realization of how extensive are the demands of the body upon the feed supply. Certainly no better illustration can be had of what a marvelous machine the animal body is.



THE AMOUNT AND CHARACTER OF THE FEED NECESSARY FOR A DAIRY COW.

The feed of a dairy cow must perform various functions. First of all it must supply the necessary fuel, as it were, to maintain the system. Then in addition to this it must provide the raw materials for the milk formation and the material for the growth of the feeders. The nature and uses of these various duties are distinctly understood. Take, for instance, milk in a daily production of 30 pounds (the average milk production which we should reasonably expect from the average dairy cow), it requires 3.87 pounds of milk solids; the maintenance will require approximately 7.38. In addition to this the dairy cow will consume a large expenditure of feed or energy to sustain nerve force, bodily activity and the production of fuel, as it were, for the warming of her water and feed, all of which may properly be charged to the work of milk formation and which will, in the average cow, approximate 5 pounds per day. It will therefore be necessary to feed such a cow approximately 16 pounds of digestible nutrients daily, if we would expect her to give 30 pounds of milk. In the case of the dairy cow a ration of one part protein to six parts carbohydrates has proved fairly satisfactory. Therefore, a cow such as the foregoing should have approximately $2\frac{1}{4}$ to $2\frac{1}{2}$ pounds of protein daily. Following we give several rations, figured out in the proper proportions, which will be found very effective:

Ration No. 1. Ten pounds of clover hay, 30 pounds of corn silage, $2\frac{1}{2}$ pounds of hominy chops, 5 pounds of wheat bran, $2\frac{1}{2}$ pounds of linseed meal (old process) and 3 tablespoonfuls of Davis Stock Food.

Ration No. 2. Fifteen pounds of clover or alfalfa hay, 25 pounds of corn silage, 4 pounds of ground oats, 5 pounds of ground peas, and 3 heaping tablespoonfuls of Davis Stock Food.

Ration No. 3. Ten pounds of corn fodder, 5 pounds of alfalfa hay, 25 pounds of sugar beets, $3\frac{1}{2}$ pounds of corn and cob meal, 3 pounds of buckwheat middlings, $1\frac{1}{2}$ pounds of cotton seed meal, and 3 tablespoonfuls of Davis Stock Food.

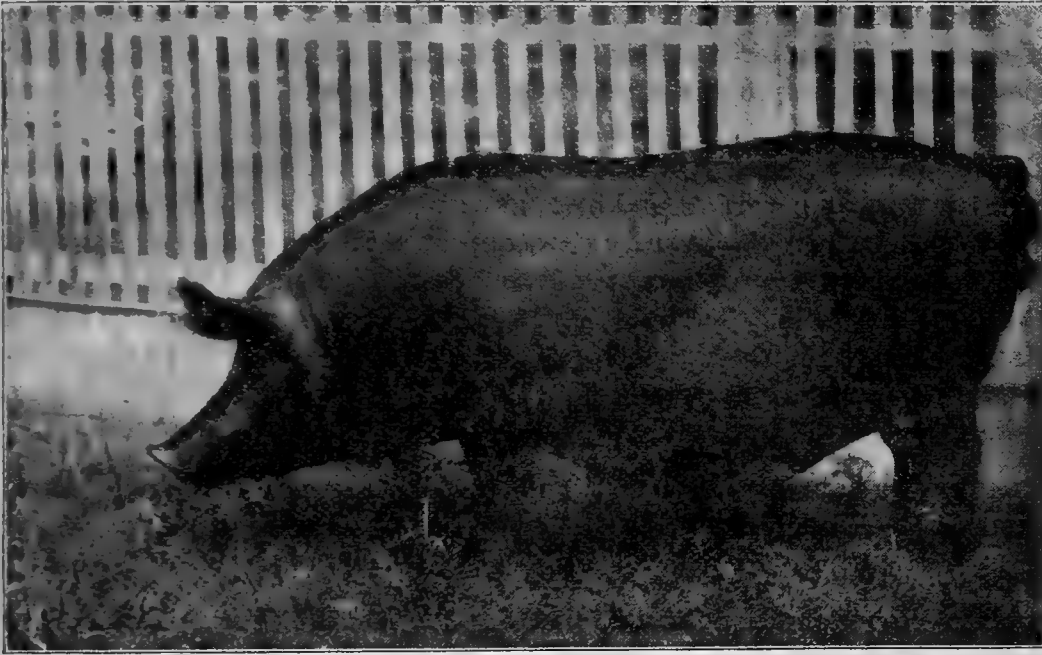
Ration No. 4. Ten pounds of mixed hay, 40 pounds of corn silage, 4 pounds of buckwheat middlings, 1 pound of gluten meal, $2\frac{1}{2}$ pounds of linseed meal, and 3 tablespoonfuls of Davis Stock Food.

The grain of the above rations should be mixed thoroughly and fed morning and evening, the roughage being fed during the day. The rations are also figured on a basis of a cow weighing 1,000 pounds or less, and giving approximately 30 pounds of milk a day. Should the cow weigh more, or should her milk production be greater, increase the ration accordingly. Under present conditions, comparatively few dairymen raise enough protein containing feeds for their consumption on the farm, and they are therefore obliged to buy quite a lot of commercial feedstuffs in order to obtain this much needed protein. There is no question whatever but that with a little care the average farmer or dairyman could raise on his own farm all the proteins consumed. The time will come when such will be the case, but under the present circumstances, when so large a quantity is being purchased, it is necessary for the farmer or dairyman to feed with as great economy as possible. And it goes without saying that he should exert every effort to obtain the maximum digestibility, not only from a grain economy standpoint but for the general health of his herd. As the cow is called upon to do an enormous amount of work, her digestive ability is taxed to the utmost. Every organ in her body should therefore be working properly; the gastric juice should be secreted in abundance; the liver should perform its functions, and the peristalsis should ever keep the bowels moving while feedstuffs are contained therein. And it requires no great argument on our part to demonstrate to the live and up to date dairyman that it is not a question with him whether or not he can afford to use Davis Stock Food, but whether he can afford to be without it. His knowledge of feeds and the digestive organs, coupled with his knowledge of the ingredients of the Davis Stock Food, answer that question emphatically.

THE HOG INDUSTRY.

Selection, Feeding and Management.

The hog has always occupied an important place in the animal husbandry of the United States. Unlike the supply of breeds of other kinds of live stock, the main dependence of American farmers for hogs has been placed upon breeds developed right here at home and, unlike other collections of live stock,



SPRINGBROOK NELLIE, No. 2102.
A Prize Winning Tamworth Sow. Weight, 800 Pounds.
Owned by W. WARREN MORTON, Russellville, Ky.

America is entitled to all the credit for the modern and highly developed pork machines that we have today. Five distinct breeds have originated within that section of the country where corn is notably a feature in farming, viz., the Chester White in Pennsylvania; the Duroc Jersey in New Jersey and New York; the Poland China in Ohio and Illinois; the Victoria in New York and Indiana and the Cheshire in New York. From these localities the breeds have been gradually disseminated over the entire country and a great number have been exported to foreign countries.

Coincident with the development of native breeds, the leading English breeds, particularly the Berkshire, have come into more or less popularity, while the Essex, the Yorkshire and the Tamworth are bred and raised more or less.

Conditions Suitable for Hog Raising.

It is a foregone conclusion that climate, soil and the environment in which the same kind of stock was placed by the Creator, and ran in a wild state, are the conditions which will be found most suitable for the

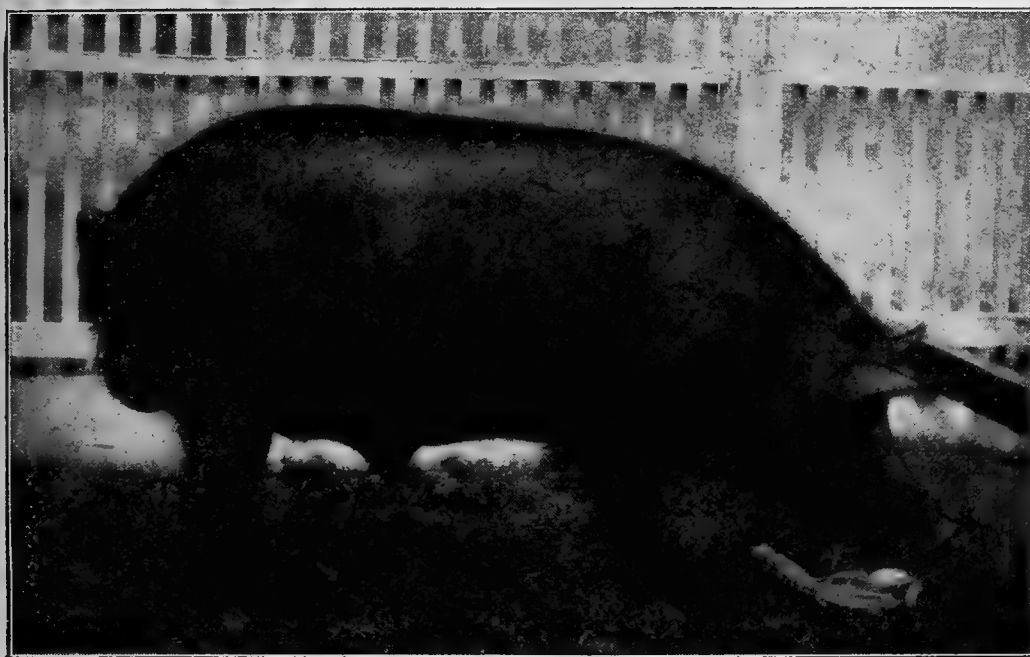
industry in that particular stock, although American ingenuity and perseverance in breeding have developed distinct types that not only thrive but prove distinctly profitable in climates and under conditions entirely new and strange to the primitive wild hog. If extremes, either of heat or cold, are common, the environment provides shelter in the dense thickets in winter and shade and an abundance of water in summer. The hog is naturally a promiscuous feeder and in his domestic state thrives best where pastures are most luxuriant and grain crops, nuts and roots are in abundance. The hog is not a ranger, nor does he thrive on grass alone, although it is a deplorable fact that a large number of American farmers deprive him of what range and grass he should actually have.



CALSTON ECLIPSE 1st, No. 4722.
Yorkshire Boar.
Owned by W. E. ROCKHILL, Warsaw, Ind.

The corn growing sections of the United States will easily take first place in pork production. It is, however, an absurd fallacy to argue that hog feeding will not give profitable returns outside of the corn belt. True, the corn belt has wonderful advantages for economical pork production, but it also has its disadvantages, and not the least of them is the effect on fecundity of feeding too much corn to breeding stock, a common fault among farmers. Any locality that will grow clover of any species, that is favorable to the production of alfalfa, peas, beans and other legumes, and where grain can be readily grown, not only corn, but barley, wheat, oats, or rye—in such localities the wonderful American hog will demonstrate his worth. Variety of feeds alone is an item that too much importance cannot be attached to. An animal tires of a constant ration of one kind and is easily thrown off his feed, when if he were supplied with a change or variety to keep his appetite keen, it not only enables the farmer to raise better pork, with a finer flavor, but enables him to raise it in less time, get a gain of more pounds per day and thus market his hogs at a greater profit. It must be remembered that the hog of today is far removed from his distant ancestor, the razorback, or wild hog, who was privileged to roam the

forests and hills, gathering for himself such roots, herbs, etc., that his instinct told him would assist digestion, keep his bowels in good condition and give the system a general tonic. Thus before man ever thought of domesticating the hog and placing him in an unnatural environment, nature found it necessary to place the hog within reach of these condiments and correctors. In other words, nature supplied the stock food. If the hog needed tonic, digestives, cathartics, cholagogues, alteratives and blood purifiers in his natural state, he certainly needs them much more under present conditions. The modern hog is living under abnormal conditions; he is given no choice in his feed, but must eat that placed



ENGLEWOOD'S FIREMAN, No. 1864.

Weight, 1,000 Pounds.

Grand Champion Tamworth Boar at World's Fair, St. Louis.

Sweepstake Winner Canadian National, Toronto.

Owned and Shown by

W. WARREN MORTON, Proprietor, Mountain Home Stock Farm,
Russellville, Ky.

before him. Naturally endowed with the appetite of a glutton, he overfeeds, oftentimes eating things which his system and digestive apparatus is not able to grapple, and under such conditions it will be found immensely profitable to the stockman to supply him with that which nature in her wisdom found necessary and of which domestic conditions have robbed him. Nux vomica, one of the ingredients of Davis Stock Food, is a small seed that acts as a bitter tonic, stimulates respiration, secretion of digestive fluids, increases the appetite and digestion and assists peristalsis. Gentian, another one of the ingredients used in Davis Stock Food, is also a bitter tonic, which improves the appetite and general tone and materially aids digestion. Another ingredient in Davis Stock Food, ferri sulphas, is a salt of iron and is among the first mineral substances to be used in medicine, which was about 3,000 years ago; its chief function in animal economy as well as in nature being that of an oxygen carrier. Iron is a normal constituent of the blood, there being one part in two hundred and thirty parts of red corpuscles and tissues, where it exists as an oxide in combination with the hematin of the blood. It also is present in the bile, lymph, chyle and in the gastric juices. Sulphur, another constituent of Davis Stock Food, when taken internally

undergoes no change in the stomach and possesses no appreciable action on that organ. It is carried into the intestines and is in part converted into sulphides by the action of the bile, where it stimulates the glandular structures and increases peristalsis. Upon being absorbed in the smaller intestines it enters the blood and acts as an alterative and has a very beneficial effect upon the skin and coat of an animal. Santonica, another ingredient, possesses an action known as anthelmintic, which means to expel worms, thus keeping the alimentary canal of the animal free from these annoying parasites. Carbo ligni, or wood charcoal, is not absorbed into the system. It acts as an intestinal antiseptic, checking fermentative changes of feed passing through the alimentary canal, and by virtue of this action will prevent the occurrence of flatulence. It thus keeps the bowels pure and absorbs the foul gases.

We will leave it to the judgment of the American stock raiser of today if the proper combination of the foregoing roots, herbs, etc., will not prove of immense benefit in the proper feeding and raising of live stock. They are gathered together in just the correct proportions in Davis Stock Food. We have special machinery for properly grinding the drugs, which we buy in carloads in the crude state, and grind them ourselves, thus insuring their purity and freedom from adulteration.

The public at large does not half appreciate the importance of the pork production industry to the United States. It is indeed doubtful if the animal industry of America would ever have attained the present position in the world of commerce had it not been for the American hog. Though it has made wondrous strides in the past, the present up to date feeding methods and the improvements that are bound to come in the next decade, will make the future even greater than the past has been. The American farmer is rapidly becoming educated to the fine art of feeding, and today instead of throwing his feed into the swine haphazard, thus wasting a large quantity of it, he is feeding by the scale, knows the analysis of his grain, and there is little reason to suspect that over production of pork will ever become a menace to the American farmer.

Fecundity.

If for no other feature alone, the hog appeals to the American farmer because of the fecundity of the sows. No other meat producing domestic animal, outside of poultry, is capable of producing so large a number of young in a year, thus enabling a farmer to turn his money over several times in pork while he is getting it once out of cattle. This fecundity is something that the American farmer should pay close attention to. It can be developed and maintained to a high degree by the judicious use of proper feeds and exercise, or it can be almost ruined by the feeding of too much corn or other foods high in carbohydrates. Free access to pastures, with plenty of exercise and green stuffs, is highly important if you would have your sows raise you a goodly number of healthy, strong pigs.

Returns from Feed Eaten.

Extensive experiments conducted by various investigators in the United States have developed the following statistics: Fattening steers liberally fed upon good feed consume on an average of some 12 to 13 pounds of dry feed per 100 pounds live weight per week, and will show 1 pound increase in weight for each 12 pounds of dry feed consumed. Sheep under similar circumstances, will consume about 15 pounds of dry substance per 100 pounds live weight per week, and should yield 1 pound increase weight for every 9 pounds of dry substance in their feed, while pigs liberally fed upon feeds composed chiefly of corn, consume 26 to 30 pounds per 100 pounds live weight per week, and will show 1 pound gain in weight to every 4 or 5 pounds of dry feed eaten. Also in their dressed weight hogs show less variation than cattle, hogs dressing from 72 to 84 per cent of the live weight, while cattle will dress as low as 55 per cent, and 70 per cent is considered high. Sheep will dress from 48 to 60 per cent.

Hog Houses, Pastures and Fences.

It is a well known fact that hogs are especially sensitive to extremes of heat and cold. The character of their shelter should therefore depend largely upon the locality in which they are. If in the North, where there are severe winters, good, warm quarters are a necessity for profitable hog raising. In building their quarters, light, ventilation, warmth and cleanliness are the four main points to be considered. A well drained location with a house built directly on a north and south line, facing east, thus giving both sides of the building an opportunity to receive direct sunlight at some part of the day, is advised.

It will be found economy and desirable to provide windows of fair size, and if in cold climates, they should be so arranged that when opened there will be no direct draft upon the hogs. The size of the house, etc., will of course depend upon the number of hogs it must accommodate, but as a general safe proposition no more than fifty breeding animals should be confined in any one building, for sanitary reasons. If the expense can be incurred, and after all it is a comparatively small matter, cement floors leading to a common drain or sewer from each pen are advised, while on top of this cement floor each pen should have a wooden platform made out of two by fours, covered with matched flooring, thus raising it about 4 inches from the cement. This gives a much warmer bed, as it has been found that hogs compelled to lie on cement floors contract colds and rheumatism. A common clay or earthen floor is one of the warmest that could be provided, but it has the disadvantage of being extremely hard to keep clean and sanitary.

Portable Houses.

For individual lots, the portable house is coming largely into favor. It has a great many advantages, inasmuch as it can be moved from time to time and from pasture to pasture. It also can be turned upside down, allowing sunlight to get inside of it during the day. These houses should, however, be made comparatively small and no more than two or three hogs should be accommodated in each one. In mild climates these portable houses are especially to be recommended, for green food is there available the greater part of the year, and the house can be moved from lot to lot and from spot to spot as the animals consume the surrounding forage. The one thing that must ever be borne in mind is that the house, no matter how or where it is built, should provide good, clean, dry sleeping quarters and above everything else, be sanitary.

Pens and Pastures.

There is a wide difference of opinion and practice regarding hog lots and pastures. It is a deplorable fact that the hog on the average farm is given a barn lot or a convenient mud hole, and more often than not deprived of the proper run and green feed so abundant around him and so necessary for profitable production. It has been found good practice to construct a number of half-acre lots, placing a portable house in every other one and give a sow and her pigs an individual house. By the time they will have eaten or stamped down all the green stuff on this half acre, the house can easily be lifted over the fence to the next lot and the hogs moved where they will have plenty of fresh, green pasture. The lot they have been taken off of can then be plowed up and sowed in rye or forage crops that grow comparatively fast, so that by the time they have exhausted the second lot they can be returned to the original one. Thus the two lots will support the sow and pigs until the pigs are old enough to wean, and will, if properly cared for, support the sow the year round. It will also be found good practice, if possible, to have a larger lot, of from five to ten acres, to turn all the pigs into after weaning time, and here they can be left until four or five months old, feeding them in the meantime, but allowing them plenty of ground and exercise so that they may develop bone and muscle and be in a good, healthy condition to go into the feed lot. Where boars are kept they should have a pen distant and out of sight of the sows and other pigs.

Selection of Breeding Stock.

In determining what breed or class of hogs you are going to raise, several things must be taken into consideration; first, the climate and environments; second, the facilities you have at your disposal, and third, but not least, the market to which you must cater. Any or all of the standard breeds of today are good and the advocates of each and every breed can give you innumerable reasons why their special favorite has many points of excellence over all others. We will, therefore, not attempt, and could not think of advocating any special breed. We will, however, give a correct and concise description of each and every one of the principal breeds, telling you why, in our estimation, a certain breed is better than another

for certain purposes; beyond this you will have to make a selection yourself and, after all is said and done, the man who is breeding and raising hogs for market must breed the type rather than the breed. He is interested in filling the pork barrel, and not in producing a pedigree, or in gaining blue ribbons.

Right here is the greatest trouble and the one great fault, if there is such a thing, that American swine breeders have fallen into. In the mad rush to take gold medals and blue ribbons and earn fancy prizes for high bred stock, we regret to say that many of them have entirely lost sight of the fundamental principles of the pork business, which after all is the production of meat. What cares the farmer if a prize boar will produce a pig conforming, even to the minutest detail, with the requirements of the score cards of the various live stock record associations, if this same pig cannot produce pork economically? While there is a necessarily wide standard of requirements by the various breeders, the men who raise pork and are looking for meat yielding and profit producing animals, all agree upon a standard, and this standard is one that has been developed by experience. They want quality, depth, length, width of form, constitutions of flesh producing capacity, and general good health, regardless of color or fine points. It was not many years ago that the distinct large type of a hog was the favorite on the market. He was the favorite because the public demanded such a class of meat, but the public is very fickle, and today the bacon hog, or the hog that produces leaner meat, is rapidly coming to the front. This does not necessarily mean that new breeds will be inaugurated, but that the existing breeds will, by elimination, by mating and special feeding, be made to conform to the demand. On the following pages we present a score card of five different breeds of hogs of the larger type. This score card is compiled from the score cards of the National Association of Expert Judges on Swine, and is copied from the Bureau of Animal Industry Bulletin No. 47, issued by the United States Government.

DETAILED DESCRIPTION.

HEAD.

Poland China.—Head broad, even and smooth between and above the eyes; slightly dished, tapering evenly and gradually to near the end of the nose; inclined to shortness, but not enough to give the appearance of stubby nose; in male a masculine expression and appearance; broad lower jaw.

Berkshire.—Head short, broad, coming well forward at poll; face short and fine and well dished, broad between the eyes, tapering from eyes to point of nose; surface even and regular.

Duroc Jersey.—Head small in proportion to size of body, wide between the eyes; face finely dished (about half way between a Poland China and a Berkshire), and tapering well down to the nose; surface smooth and even.

Chester White.—Head short and wide; cheeks neat, but not too full; jaws broad and strong; forehead medium, high and wide; face short and smooth, wide between the eyes; nose neat and tapering and slightly dished.

Victoria.—Head rather small and neat; face medium, dished and smooth, wide between eyes, and tapering from eyes to nose.

OBJECTIONS.

Poland China.—Head long and narrow between the eyes; nose uneven and coarse; too large at the muzzle or head too short; not full or high above the eyes or too much wrinkled around or above the eyes.

Berkshire.—Head long, narrow and coarse; forehead low and narrow; jaws narrow or contracted; lower jaw extending beyond upper; face long and straight between eyes; nose coarse, thick, or crooked, or ridgy.

Duroc Jersey.—Head large and coarse; narrow between the eyes; face straight; nose crooked or too much dished.

Chester White.—Head long, narrow and coarse; forehead low and narrow; jaws contracted and weak; face long, narrow and straight; nose coarse, clumsy, or dished like a Berkshire.

EYES.

Poland China.—Full, clear, prominent and expressive.

Berkshire.—Very clear, rather large, dark hazel or gray.

Duroc Jersey.—Lively, bright and prominent.

Chester White.—Large, bright, clear and free from wrinkles of surrounding fat.

Victoria.—Medium size, prominent, bright, clear and lively in young, and of quiet expression in aged animals.

OBJECTIONS.

Poland China.—Dull of expression, deep set, or obscure; sight impaired by wrinkles, fat or other causes.

Berkshire.—Small, dull, bloodshot, deep set, or obscure; sight impaired by wrinkles, fat or other causes.

Duroc Jersey.—Dull, weak and obscure.

Chester White.—Small, deep, or obscure; sight impaired in any way.

EARS.

Poland China.—Ears attached to the head by a firm short knuckle, giving free and easy action; standing up slightly from the base to within two-thirds of the tip, where a gentle break or drop should occur; in size neither too large nor too small, but even, fine, thin, leaf shape; slightly inclined outward.

Berkshire.—Generally almost erect, but sometimes inclined forward with advancing age; medium size, thin and soft.

Duroc Jersey.—Medium, moderately thin, pointing forward, downward and slightly outward, carrying a slight curve; attached to the head very neatly.

Chester White.—Medium size, not too thick, soft; attached to the head so as not to look clumsy; pointing forward and slightly outward; fully under control of the animal; drooping so as to give a graceful appearance.

OBJECTIONS.

Poland China.—Large, floppy, straight, upright, or coarse; knuckle long, letting the ear drop too close to the head and face, hindering the animal in their free use.

Berkshire.—Large, coarse, thick, round, or drooping; long or large knuckle; difference in form or position from each other; animal unable to control their position.

Duroc Jersey.—Very large, nearly round, very thick, swinging or flabby; not of same size; differing in position, and not under control of animal.

Chester White.—Large, upright, coarse, thick, round, too small, dropping too close to the face, animal unable to control them.

NECK.

Poland China.—Short, wide, even, smooth, well arched; rounding and full from poll to shoulder, with due regard to the characteristics of the sex.

Berkshire.—Full, deep, short, and slightly arched, broad on top, well connected with shoulders.

Duroc Jersey.—Short, thick and very deep and slightly arching.

Chester White.—Wide, deep, short and nicely arched.

Victoria.—Medium wide, deep, short, well arched, and full at top.

OBJECTIONS.

Poland China.—Long, narrow, thin and drooping from the shoulder to the poll, with unevenness caused by wrinkles or creases.

Berkshire.—Long, flat, lacking in fullness and depth.

Duroc Jersey.—Long, shallow and thin.

Chester White.—Long, narrow, thin, flat on top, tucked up, not extending down to the breast bone.

JOWL.

Poland China.—Full, broad, deep, smooth and firm, carrying fullness back near to point of shoulders and below line of lower jaw, so that lower line will be as low as breast bone when head is carried up level.

Berkshire.—Full, firm and neat, carrying fullness back to shoulder and brisket.

Duroc Jersey.—Broad, full and neat, carrying fullness back to point of shoulder, and on a line with breast bone.

Chester White.—Full, smooth, neat and firm, carrying fullness back to shoulder and brisket when the head is carried up level.

Victoria.—Medium full, nicely rounded, neat and free from loose, flabby fat.

OBJECTIONS.

Poland China.—Light, flabby, thin and wedged shaped; deep wrinkled, not drooping below the line of lower jaw, and not carrying fullness back to shoulder and brisket.

Berkshire.—Light, flabby, thin, tucked up or wrinkled.

Duroc Jersey.—Too large, loose and flabby; small, thin and wedging.

Chester White.—Light, too large and flabby, rough and deep wrinkled; not carrying fullness back to shoulder and brisket.

SHOULDERS.

Poland China.—Broad, and oval at the top, showing evenness with the back and neck, with good width from the top to the bottom, and even, smoothness extending well forward.

Berkshire.—Broad, deep and full; not extending above line of back; and as wide on top as on back, carrying side down to line of belly, and having lateral width.

Duroc Jersey.—Moderately broad, very deep and full, carrying thickness well down and extending above line of back.

Chester White.—Broad, deep and full, extending in a straight line with the side, and carrying size down to line of belly.

Victoria.—Broad, deep and full; not higher than the line of back, and as wide on top as on back.

OBJECTIONS.

Poland China.—Narrow at the top or bottom, not so deep as the body, uneven width; shields on pigs under eight months of age, or showing too much shield at any age.

Berkshire.—Lacking in depth or width; thick beyond the line of sides and hams or extending above line of back; heavy shields on hogs under eighteen months of age.

Duroc Jersey.—Small, thin, shallow, extending above line of back; boars under one year old heavily shielded.

Chester White.—Narrow at top or bottom; not full nor same depth as body, extending above line of back shields on boars too coarse and prominent.

CHEST.

Poland China.—Large, wide, deep and full; even underlined to the shoulder and sides, with no creases; giving plenty of room for heart and other organs, making a large girth, indicating much vitality. Brisket smooth, even and broad; wide between the legs, and extending well forward, showing in front.

Berkshire.—Large, wide, deep and roomy; full girth; breast bone curving well forward; extending back on level; not tucked up; broad between fore legs.

Duroc Jersey.—Large, very deep, filled full behind shoulders; breast bone extending well forward so as to be readily seen.

Chester White.—Large, deep and roomy, so as not to cramp vital organs; full in girth around the heart; the breast bone extending forward so as to show slightly in front of legs, and let down so as to be even with the line of belly; showing a width of not less than 7 inches between the fore legs of a full grown hog.

Victoria.—Large, wide, deep and roomy, with a large girth back of shoulders.

OBJECTIONS.

Poland China.—Pinched appearance at the top or bottom, or tucked in back of the fore legs; showing too narrow between the legs; not depth enough back of the shoulders; brisket uneven, narrow, not prominent.

Berkshire.—Flat, narrow at top or bottom, small girth, lacking depth of fullness; breast bone crooked or tucked up.

Duroc Jersey.—Flat, shallow, or not extending well down between fore legs.

Chester White.—Narrow, pinched, heart girth less than flank girth, too far let down between fore legs, breast bone crooked or too short.

BACK AND LOIN.

Poland China.—Broad, straight, or slightly arched, carrying same width from shoulder to ham; surface even, smooth, free from lumps, creases or projections; not too long, but broad on top, indicating well strung ribs; should not be higher at hip than at shoulder and should fill out at junction with side, so that a straight edge placed along at top of side will touch all the way from point of shoulder to point of ham; should be shorter than lower belly line.

Berkshire.—Broad and straight, carrying same width from shoulder to ham; surface even and smooth, without creases or projections, and not too long.

Duroc Jersey.—Back medium in breadth, straight or slightly arching, carrying even width from shoulder to ham; surface even and smooth.

Chester White.—Back broad on top, straight or slightly arched, uniform width, smooth, free from lumps or rolls, shorter than lower belly line, same height and width at shoulders as at ham; loin wide and full.

Victoria.—Broad, straight, are slightly arched, carrying same width from shoulders to ham; level and full at loin; sometimes higher at hip than at shoulder.

OBJECTIONS.

Poland China.—Narrow, creased back of shoulders, swayed or hollow, dropping below a straight line; humped or wrinkled; too long or sunfish shape; loin high, narrow, depressed, or humped up; surface lumpy, creased, ridgy or uneven; width at sides not so great as shoulder and ham.

Berkshire.—Narrow, swayed or hollow, dropping below a straight line.

Duroc Jersey.—Narrow, creased behind the shoulders, swayed or humped back.

Chester White.—Back narrow, creased back of shoulders, sunfish shape, humped, swayed, too long or lumpy rolls, uneven in width; loin narrow, depressed or humped.

SIDES AND RIBS.

Poland China.—Sides full, firm and deep, free from wrinkles, carrying size down to belly; even from ham to shoulders, ribs of good length, well sprung at top and bottom.

Berkshire.—Sides, full, smooth, firm, and deep, carrying size down to belly; even from ham to shoulder; ribs long, strong, well sprung at top and bottom.

Duroc Jersey.—Sides very deep, medium in length, level between shoulders and hams and carrying out full down to line of belly; ribs long, strong and sprung in proportions to width of shoulders and hams.

Chester White.—Sides full, smooth, deep, carrying size down to belly; even with lines of ham and shoulder; ribs long, well sprung at top and bottom, giving the hog a square form.

Victoria.—Ribs well sprung at top, strong and firm; sides deep, full, smooth and firm, free from creases.

OBJECTIONS.

Poland China.—Flat, thin, flabby, pinched, not as full at bottom as at top; drawn in at shoulder, so as to produce a crease, or pinched and tucked up and in, as it approaches the ham; uneven surface; ribs flat or too short.

Berkshire.—Flat, thin, flabby, not so full at bottom as at top; ribs weak; not well sprung at top or bottom.

Duroc Jersey.—Flabby, creased, shallow and not carrying proper width from top to bottom.

Chester White.—Flat, thin, flabby, compressed at top, shrunken at shoulder and ham; uneven surface; ribs flat and too short.

BELLY AND FLANK.

Poland China.—Belly broad, straight and full, indicating capacity and room, being about the same or on a level at the flank with the under line of the chest. Under line straight, or nearly so, and free from flabby appearance.

Berkshire.—Wide, full and straight on bottom line.

Duroc Jersey.—Straight and full and carrying well out to line of sides; flank well down to lower line of sides.

Chester White.—Same width as back, full, making a straight line and dropping as low at flank as at bottom of chest; line of lower edge running parallel with sides; flank full and even with body.

Victoria.—Wide, straight and full; as low or slightly lower at flank than at chest; flank full and nearly even with the sides.

OBJECTIONS.

Poland China.—Belly uneven and flabby, or apparent looseness in the make up. Pinched up in the flank or flanked too high.

Berkshire.—Belly narrow and saggy; flank thin and tucked up.

Duroc Jersey.—Narrow, tucked up or drawn in, sagging or flabby.

Chester White.—Belly narrow, pinched, sagging, or flabby; flank thin, tucked up or drawn in.

HAMS AND RUMP.

Poland China.—Hams broad, full, deep and long from rump to hock; fully developed above and below, being wide at the point of the hips, carrying width well down to the lower part of the hams; fleshy, plump, rounding fullness perceptible everywhere; rump rounding and gradually sloping from the loin to the root of the tail; broad and well developed all along from loin and gradually rounding to the buttock; lower front part of ham should be full, and stifle well covered with flesh; even width of ham and rump with the back, loin and body; even a greater width as to females not objectionable.

Berkshire.—Hams broad, full and long; the lower front part of ham should be full and stifle well covered with flesh, coming well down on hock; rump should have a rounding slope from loin to root of tail, same width as back, and filling out on each side and above the tail.

Duroc Jersey.—Broad, full and well let down to the hock; buttock full and coming nearly down and filling full between hocks; rump should have a round slope from loin to root of tail, same width as back and well filled out around tail.

Chester White.—Ham broad, full, wide, long and deep, admitting of no swells; buttock full, neat and clean, thus avoiding flabbiness; stifle well covered with flesh, nicely tapering toward the hock; rump should have a slightly rounding shape from loin to root of tail, same width as back, making an even line with sides.

Victoria.—Hams long, full, wide, nicely rounded, trim and free from fat; buttocks large and full, reaching well down toward hocks; rump slightly sloped from end of loin to root of tail.

OBJECTIONS.

Poland China.—Hams short, narrow, too round, or too slim, not filled out above or below, or unshapely for deep meat; not so wide as the body; back or loin too tapering or small; rump narrow or pointed, not plump or well filled, or too steep from loin to tail.

Berkshire.—Ham narrow, short, thin, not projecting beyond and coming down on hock; cut up too high in crotch; rump flat, narrow or too steep.

Duroc Jersey.—Ham narrow, short, thin, not projecting well down to hock; cut up too high in crotch; rump narrow, flat, or peaked at root of tail, or too steep.

Chester White.—Ham narrow, short, not filled out to stifle, too much cut up in crotch or twist, not coming down to hock; buttock flabby; rump flat, narrow, too long, too steep, sharp or peaked at root of tail.

LEGS AND FEET.

Poland China.—Legs medium length, straight, set well apart and squarely under body, tapering, well muscled and wide above knee and hock; below hock and knee, round and tapering, capable of sustaining weight of animal in full flesh without breaking down; bone firm and of fine texture; pastern short and nearly upright; feet firm, short, tough and free from defects.

Berkshire.—Legs short, straight, and strong, set wide apart with hoofs erect and capable of holding good weight.

Duroc Jersey.—Medium size and length, straight, nicely tapered, wide apart and well set under the body; pastern short and strong; feet short, firm and tough.

Chester White.—Legs short, straight, set well apart and squarely under body; bone of good size; firm, well muscled, wide above knee and below knee and hock round and tapering, enabling the animal to carry its weight with ease; pastern short and nearly upright; feet short, firm, tough and free from defects.

Victoria.—Legs short, set well apart and firm, wide above knee and hock, tapering below; feet firm and standing well up on toes.

OBJECTIONS.

Poland China.—Legs long, slim, coarse, crooked; muscles small above hock and knee; bone large, coarse, as large at foot as above knee; pastern long, slim, crooked or weak; the hocks turned in or out of straight line; legs too close together; hoofs long, slim and weak; toes spreading or crooked or unable to bear up weight of animal without breaking down.

Berkshire.—Legs long, slim, coarse, crooked; muscles light, pastern long, slim or flat; feet long or sprawling.

Duroc Jersey.—Legs extremely long or very short, slim, coarse, crooked; as large below knee and hock as above, set too close together; hocks turned in or out of straight line; feet, hoofs long, slim, and weak toes, spreading or crooked.

Chester White.—Legs too short, long, slim, crooked, too coarse, too close together; weak muscles above hock and knee; bone large and coarse, without taper; pastern long, crooked, slim like a deer's; hoofs long, slim, weak; toes spreading, crooked or turned up.

TAIL.

Poland China.—Tail of medium length and size, smooth and tapering well and carried in a curl.

Berkshire.—Set well up, fine, tapering and neatly curled.

Duroc Jersey.—Medium, large at base and nicely tapered and rather bushy at end.

Chester White.—Small, smooth, tapering, well set on, root slightly covered with flesh, carried in a curl.

Victoria.—Small, fine and tapering, nicely curled.

OBJECTIONS.

Poland China.—Coarse and long without a curl; or short crooked or stubby; or too small, fine, even, not tapering.

Berkshire.—Coarse and straight, too low.

Duroc Jersey.—Extremely heavy, too long, ropy.

Chester White.—Coarse, long, clumsy, set too high or too low, hanging like a rope.

COAT.

Poland China.—Fine, straight, smooth, lying close to and covering the body well; not clipped; evenly distributed over the body.

Berkshire.—Fine, straight, smooth, lying close to and covering the body well; not clipped; evenly distributed over the body.

Duroc Jersey.—Moderately thick and fine, straight, smooth, and covering the body well.

Chester White.—Fine straight, or wavy, evenly distributed and covering the body well; nicely clipped coat no objection.

Victoria.—Fine and silky, evenly covering the body.

OBJECTIONS.

Poland China.—Bristles and hair coarse, harsh, thin, wavy or curly; swirls, standing up, ends of hairs split and brown, not evenly distributed over all of the body except belly; clipped coat should be cut 1.5 points.

Berkshire.—Hair coarse, harsh, wavy or curly, not evenly distributed over body; swirls or clipped.

Duroc Jersey.—Too many bristles, hair coarse, harsh and rough, wavy or curly; swirls or not evenly laid over the body.

Chester White.—Bristles and hair coarse, thin, standing up, not evenly distributed over the body except the belly.

COLOR.

Poland China.—Black, with six white points—tip of tail, four white feet and white in face, on the nose or on the point of lower jaw—all to be perceptible without close examination; splashes of white on the jaw, legs or flank, or a few spots of white on the body not objectionable.

Berkshire.—Black, with white on feet, face, tip of tail, and an occasional splash on arm.

Duroc Jersey.—Cherry red, without other admixtures.

Chester White.—White (blue spots or black specks in skin shall not indicate impurity of blood).

Victoria.—White, with occasional dark spots on skin.

OBJECTIONS.

Poland China.—Solid black, white mixed or sandy spots; speckled with white hairs over the body; mottled face of white and black; hair mixed, making a grizzly appearance.

Berkshire.—Solid black or black points, or white spots on body.

Duroc Jersey.—Very dark red, or shading brown, very pale or light red, black spots over the body, black flecks on belly and legs not desired, but admissable.

Chester White.—Color any other than white.

SIZE.

Poland China.—Large for age; condition, vigor and vitality to be considered. There should be a difference between breeding animals and those kept or fitted for the show of at least 25 per cent in size. In show condition, or when fat, a two year old boar should weigh not less than 600 pounds;

and a sow not less than 500 pounds; boar one year old and over, 400 pounds; sow, 350 pounds; boar eighteen months old, 500 pounds; sow, 450 pounds; boars and sows six months old, not less than 160 pounds; all hogs in just fair breeding condition one-fourth less for size. The keeping and chance that a young hog has cuts quite a figure in his size and should be considered, other points being equal. Fine quality and size combined are the desirable points.

Berkshire.—Large for age; boar two years and over, not less than 450 pounds; sow same age, 400 pounds; boar eighteen months old, 350 pounds; sow same age, 325 pounds; boar twelve months old, 300 pounds; sow same age, 275 pounds; boar and sow six months old, 150 pounds.

Duroc Jersey.—Large for age and condition; boar two years old and over should weigh 600 pounds; sow same age and condition, 500 pounds; boar eighteen months old, 475 pounds; sow, 400 pounds; boar twelve months old, 350 pounds; sow, 300 pounds; boar and sow pigs six months old, 150 pounds. These figures are for animals in a fair show condition.

Chester White.—Large for age and condition; boar two years old and over, if in good flesh, should weigh not less than 500 pounds; sow same age and condition, not less than 450 pounds; boar eighteen months old, in good flesh, should weigh not less than 400 pounds; sow, 350 pounds; boar twelve months old, not less than 300 pounds; sow, 300 pounds; boars and sows six months old, not less than 150 pounds each, and other ages in proportion.

Victoria.—Boar two years old and over, when in good condition, should weigh not less than 500 pounds; sow, same age and conditions, 450 pounds; boar twelve months old, not less than 300 pounds; sow in good flesh, 300 pounds; pigs five to six months old, 140 to 160 pounds.

OBJECTIONS.

Poland China.—Overgrown, coarse, flabby, loose appearance; gangling, hard to fatten; too fine; undersized; short, stubby, inclined to chubby fatness; not a hardy, robust animal.

Berkshire.—Underweight, coarse, not in good form to fatten.

Duroc Jersey.—Rough and coarse and lacking in feeding qualities.

Chester White.—Overgrown, coarse, uncouth, hard to fatten.

ACTION AND STYLE.

Poland China.—Action vigorous, easy and graceful; style attractive; high carriage; in males testicles should be prominent and of about the same size, yet not too large and pouchy.

Berkshire.—Action vigorous; style graceful and attractive.

Duroc Jersey.—Action vigorous and animated; style free and easy.

Chester White.—Action easy and graceful; style attractive; high carriage; in males testicles should be readily seen, same size and carriage.

Victoria.—Action easy and graceful but quiet.

OBJECTIONS.

Poland China.—Clumsy, slow, awkward movement; low carriage; wabbling or twisted walk; a seemingly tired or lazy appearance; not standing erect or firm.

Berkshire.—Dull, sluggish and clumsy.

Duroc Jersey.—Dull or stupid, awkward and wabbling; boar's testicles not easily seen, nor of same size or carriage, too large or only one showing.

Chester White.—Sluggish, awkward, low carriage, wabbling walk; in males testicles not evenly seen, not of the same size or carriage, or only one showing.

CONDITION.

Poland China.—Healthy, skin clear of scurf, scales or sores; soft and mellow to the touch; flesh fine, evenly laid on and free from lumps and wrinkles; hair soft and lying close to body; good feeding qualities.

Berkshire.—Healthy, skin clear of scurf, scales or sores; soft and mellow to the touch; flesh fine, evenly laid on and free from lumps; hair soft and lying close to body; good feeding qualities.

Duroc Jersey.—Healthy, skin free from any scurf, scales, sores or mange; flesh evenly laid over entire body and free from any lumps.

Chester White.—Healthy, skin clear and bright, free from scurf or sores; flesh fine and mellow to the touch, evenly laid on and free from lumps; good feeding qualities.

Victoria.—Healthy, skin clear and white or pink in color; free from scurf; firm flesh and evenly laid on.

OBJECTIONS.

Poland China.—Unhealthy, skin scaly, wrinkled, scabby or harsh; flabbiness or lumpy flesh; too much fat for breeding; hair harsh, dry and standing up from body; poor feeders; deafness, partial or total.

Berkshire.—Unhealthy, skin scaly, scabby or harsh; flabbiness or lumpy flesh, too much fat for breeding; hair harsh, dry and standing up from body; poor feeders; deafness, partial or total.

Duroc Jersey.—Unhealthy, scurfy, scaly, sores, mange, too fat for breeding purposes; hair harsh and standing up; poor feeders.

Chester White.—Unhealthy, skin scaly, scabby or harsh; flesh lumpy or flabby; hair harsh, dry and standing up from body; poor feeders; total deafness.

DISPOSITION.

Poland China.—Lively, easily handled, and seeming kind and responsive to good treatment

Berkshire.—Quiet, gentle and easy to handle.

Duroc Jersey.—Very quiet and gentle; easily handled or driven.

Chester White.—Quiet, gentle and easily handled, with ambition enough to look out for themselves if neglected.

Victoria.—Quiet and gentle.

OBJECTIONS.

Poland China.—Cross, sluggish, restless; wild, or of vicious turn.

Berkshire.—Cross, restless, vicious and wild.

Duroc Jersey.—Wild, vicious or stubborn.

Chester White.—Cross, restless, vicious or wild; no ambition.

DISQUALIFICATIONS—FORM.

Berkshire.—Very large and heavy or drooping ears; small, cramped chest, crease back of shoulders and over the back so as to cause a depression in back easily noticed; deformed or crooked legs; feet broken down so that the animal walks on pastern joints.

Duroc Jersey.—Ears standing erect; small, cramped chest; crease back of shoulders and over back so as to cause a depression in the back easily noticed; seriously deformed legs; badly broken down feet.

Chester White.—Upright ears, small, cramped chest; creased around back of shoulders and over the back, causing depression easily noticed; feet broken down, causing the animal to walk on joints; deformed or badly crooked legs.

Victoria.—Crooked jaws or deformed face; crooked or deformed legs; large, coarse, drooping ears.

SIZE.

Berkshire.—Overgrown, gangling, narrow, contracted, or not two thirds large enough for age.

Duroc Jersey.—Very small or not two-thirds large enough, as given by the standard.

Chester White.—Chuffy, or not two-thirds large enough for age.

CONDITION.

Berkshire.—Barrenness, deformed, seriously diseased, total blindness from any cause.

Chester White.—Squabby fat, deformed, seriously diseased, barrenness, total blindness.

Victoria.—Excessive fatness, barrenness, deformity in any part of the body.

SCORE.

Berkshire.—Less than 60 points.

Duroc Jersey.—Less than 50 points.

Chester White.—Less than 60 points.

PEDIGREE.

Berkshire.—Not eligible to record.

Duroc Jersey.—Not eligible to record.

Chester White.—Not eligible to record.

Victoria.—Not eligible to record.

COLOR.

Chester White.—Black or sandy spots in hair.

Victoria.—Other than white or creamy white, with occasional dark spots in skin.

DIFFERENCES BETWEEN BREEDS AS UNITS.

The foregoing remarks will apply to the individual characteristics of the animals of the different breeds, regarding them simply from a pork producing standpoint. Considering each breed as a unit it will be noticed that there are varying degrees of adaptability to environment. One breed succeeds well in a certain locality, and under certain conditions, while others do not. Some breeds are adapted to grazing and rustling better than others; and these same requirements will enable the prospective hog breeder to determine to a large degree what he is going to raise.

Breeders.

After the locality and breed have been decided upon, and the various details that are incident to a beginning are settled, it may be well for the beginner to examine into his own qualifications. To make stock raising of any kind a success, a man must be, first of all, a lover of animals, taking a delight in their growth and development, and quick to understand their needs. He must enjoy the labor of caring for them, and must be willing to give that labor without grudging and often without stint. He should be cleanly and neat in habits, and then his barnyard should be likewise. A knowledge of some of the laws of sanitation and veterinary science will be a great help, and an acquaintance with the principles of selection and breeding of stock is of course a necessity. The apparent ease with which many men succeed with live stock is due in large measure to the possession of this intimate knowledge of the habits and requirements of their animals. They do not pamper their stock, but they never neglect it. The personality of the breeder, including good health, natural intelligence, etc., has more to do with success or failure than any other factor, after a suitable location, and will do wonders toward overcoming a harsh climate and an unproductive soil.

The Foundation Herd.

The first selection of breeding stock is of prime importance. The effects of mismatching are always difficult to breed out of a herd, and the effects on a beginner is such that a mistake may completely discourage him. It is good economy to make haste slowly at this time. The start should be made with a few animals; five sows will make a large enough herd for the first year. They should be good individuals, and it will even be much better to buy one high class sow than five poor ones. This will be real economy and the development of the herd will prove its value. It will be well if a beginner can obtain the assistance of an old and successful breeder in making his start.

Selecting the Sows.

The expression, "The male is half the herd," is repeatedly quoted. So far as our knowledge of heredity has developed, other conditions being equal, there is uniform prepotency in both sexes; the influence of the two parents on the offspring is theoretically equal. Therefore, if the boar is half the herd, the sows certainly make up the other half, and their selection is a highly important matter. They may be purchased, already bred, some time before the boar, and quite an item of expense will thus be saved. Then,

by the time the sows have been watched and studied for a season and have each raised a litter of pigs, the owner will be much better prepared to select a suitable male, and he can then get one to use on both dams and offsprings. The sows selected should be nearly the same age, which should be about twelve months, and all should be safe in pig, preferably to the same boar. Their individual characteristics should, perhaps, be first looked to. While hogs do not show the strong difference of sex that we look for in a cow or mare, these always constitute a marked feature of a good-brood sow. The smoother forehead and lighter, finer neck are points of decision from the signs of masculinity in a boar. The forehead should be broad between the eyes, the throat clean and trim, the neck moderately thin, and the shoulders smooth and deep; the back should be fairly wide and straight, and ample room for the vital organs should be provided by a good width and depth of chest, well sprung ribs and straight, deep sides—a deep, capacious body from end to end. Depth of chest and abdomen are especially important in a brood sow. Pinched chests and waists must be avoided. It is generally advised that sows with much length of body should be selected for breeding purposes, length of body being regarded as an indication of fecundity. It will certainly do no harm to select sows that are especially long, but care should be taken that quality go with the increase in length. The loose jointed, long coupled, slow maturing and slow fattening type should not be allowed to get a foothold in the herd. The influence of length of body on a sow's fecundity is by no means positively known. Many short bodied sows have proved to be wonderfully prolific breeders. The surest means by which to select prolific sows is to keep an accurate record of the herd and cull all sows that do not yield a certain percentage annually. Each sow should have at least twelve well developed teats, thus providing for the proper nourishment of large litters.

The important qualifications of the market hog should be looked for; viz., smoothly covered shoulders, a wide, straight, deeply fleshed back, well sprung ribs, straight, deep sides, broad rumps, and deep, well rounded hams. A broad, well developed pelvic cavity will generally insure a sow easy in parturition. The body should stand on moderately short, straight legs, with a moderate amount of bone. All hogs, particularly breeding animals, should stand well up on the toes. There is a tendency, more marked in some breeds than in others, for the pasterns to break down so that the animal walks on the pastern bone instead of on the toes. This is particularly the case with the hind pasterns and is more often noticed in boars than in sows. It is a weakness that seriously impairs the usefulness of the animal.

Brood sows should, of course, show quality, but this should not become overrefined and delicate. Extremes of refinement usually lead to delicacy of constitution and often accompany sterility. As a last but very important point, these first sows should be uniform in type. Uniformity of type goes far beneath the surface. It includes every part of the internal organization. The reproductive system, the digestive system, the circulatory system, and even the nervous system influence uniformity. The breeder may often be disappointed in his results from sows that he thought were of a uniform type. His pigs are a heterogeneous lot, unpleasing to the eye, unsatisfactory in the feed lots, and profitless to the pocket. In such a case a lack of uniformity in the powers of heredity may, no doubt, be assigned as the cause of these unfortunate results. It must be borne in mind that it is comparatively easy to select sows that are uniform in quality, constitution and conformation. This may be done by any skillful judge of hogs. But our only basis for the selection of animals uniform in reproductive powers and heredity of type is the breeding records of their sires and dams and the standard of the herd from which they come. For this reason it is readily apparent why it is an advantage for the beginner to select his sows from one well established herd. Whether the sows will be uniform in breeding powers can only be determined definitely by testing them in the herd, but to select them from the same herd or from herds of similar breeding will be a reasonable guarantee of good results. When a sow has shown herself to be a prolific breeder she should be retained as long as her reproductive powers are maintained. Uniformity in a herd is the surest index to the worth of the stock and the skill of the breeder, and its advantages are obvious. A uniform lot of pigs will feed better, look better when fattened, and command a higher price on the market than a mixed lot. With a bunch of sows closely conforming to the same standard, whose reproductive powers are similar, uniform pigs may be expected. The importance of the male in the herd should not be asserted at the expense of the females, yet the importance of the male of marked excellence must not be minimized. The boar represents 50 per cent of the reproductive powers concentrated in one animal; the sows represent an equal amount of reproductive force, divided up among ten or twenty

or fifty individuals. If, then, these females do not, in their conformation and fecundity, conform strictly to the same type, they are merely convenient machines for the birth and rearing-of young, not what they might be, an influential force in furthering the plans of the breeder and raising the standard of the herd. It is not proposed to discuss at length in these pages the operation of the forces of prepotency as varying factors in breeding operations. The relative influence of one parent over another, the swamping of a weakly organized female influenced by a strong prepotent male factor, or vice versa, are interesting and important, but belong to the special study of heredity.

Selecting the Boar.

If there is a tendency at times to exhaust unduly the influence of the boar, and neglect that of the sow, the beginner should not permit himself to reverse things and entirely neglect the boar. It was, indeed, the feeling that any male could be used so long as he had sufficient strength for service that brought about arguments in favor of the value of the boar. A breeder cannot afford to neglect the animals of either sex. The male has, perhaps, the greater influence on the herd, for the simple reason that every pig in the herd is sired by him, whereas they have not all the same dam. To achieve the best results, a breeder should never allow the standard of his sows to be lowered, and should always couple them with a boar of a little better grade. One thing must not be forgotten, and it indicates the chief difference between the influence of the two sexes in the herd: A superior boar may be used on a herd of inferior sows with good results, but the use of an inferior boar on sows of high quality will have a disastrous outcome. The one method raises the standard of the herd; the other invariably lowers it. A boar with the male characteristics strongly developed should be selected, preferably as a yearling, or else as a pig that had been purchased at the same time as the sows and allowed to come to maturity before using. He should have a strongly masculine head, and a well crested neck. His shoulders should be developed according to age; but strong shoulder development in pigs under a year or eighteen months is objectionable.

The same indications of a good pork producing carcass that the sows require should be seen in the boars—a broad, straight, deeply fleshed back, much depth and length of sides, and well developed hind quarters. The boar should be selected to correct any defects that may be common to the sows; for example, if the sows are rather coarse in bone and loosely built, the boar should have high quality—fine bones, skin and hair. If the sows tend toward overrefinement and delicacy, the boar should be rather rangy and strong boned. There is a common belief that the male parent influences principally the extremities and general appearance of the offspring, while the vital organs (the heart, lungs and viscera) resemble those of the female parent. This theory is strongly questioned by some modern authorities on heredity; but, so long as our knowledge of the subject is so limited and this particular phase is in dispute, it can do no harm to select breeding animals according to the old ideas. The visible organs of the reproductive system should be well developed and clearly defined. A boar should not be bought with small, indefinitely placed testicles. Avoid particularly a boar with only one testicle visible. The boar should stand up on his toes. There should not be the slightest indication of weakness in the pasterns of the young ones; in a matured boar (two or three years of age) that has seen hard service, it may be expected that he will be a little down on his pasterns, but a six or eight months old pig that does not carry himself on upright pasterns is not a safe animal to select for a herd boar; the hind pastern will be in much danger of breaking down with a little age and service. Look carefully to the set of the hind legs. The back should be carefully set, straight and closely coupled to the hind quarters. A crooked or long coupled back is as great a drawback as a weak pastern.

Feed and Management.

The details of selection, feed and management of live stock are intricately interwoven and interdependent. A man may be an excellent judge of stock, able to select those animals from his herd whose use will give the best results in breeding, but if his system of feeding and management is not such that the animal will thrive and yield a good increase, good selecting is rendered ineffective. On the other hand, the herd may be carefully fed and skillfully managed, the feed may be the best and properly combined, the shelter warm and dry and the water supply pure, but if the herd is poorly selected the owner is practically throwing away the feed he gives them.

The Sows.

Hogs require attention, regardless of condition, age or sex, but the management of the brood sows is the surest test of the breeder's skill. If the sows are carelessly fed during pregnancy, trouble of some kind is sure to ensue at farrowing; if overfed after farrowing, losses may occur among the pigs from scours and thumps. At no time is the development of the pigs so easily influenced as while they are dependent on the sow's milk, the first month of life. Excepting the ravages of epidemic, perhaps the greatest death losses in the herd occur during this time, including farrowing. The accidents during farrowing, an attack of scours due to the milk of the dam, or a chill while following the sow in pasture on a wet day, may stop growth temporarily, leaving a permanently stunted pig, or may result fatally. On the other hand, the results of good management during pregnancy are as marked as the unfortunate consequences of careless methods.

Management During Pregnancy.

It is assumed that bred sows are purchased as the foundation stock. If these sows are not all from the same herd, they should not be placed together until they are all known to be free from vermin and contagious disease. They must be washed or dipped and quarantined from each other at least thirty days. If they come from the same herd, quarantine may not be necessary. It is always well for the purchaser to ascertain from the seller the details of management and feeding to which the animals were accustomed before changing owners. This system of feeding should be conformed to, or, if this is not possible, the old ration should be gradually replaced by the more convenient one, the time of transition being from ten days to two weeks. For the first few days newcomers should be fed lightly.

During pregnancy two facts must be borne in mind. The first is that the sow is doing double duty. Not only is she keeping up her own bodily functions, but the development of the fetal litter is a constantly increasing drain on her system. Her feed should consist of grains and tubers rich in protein. The ration should never be allowed to become excessive in carbohydrates. By referring to other parts of this book, in which feedstuffs are fully described, the attendant can easily figure out a well balanced ration. To this should be added Davis Stock Food in proportion of 1 tablespoonful of Davis Stock Food to each 10 pounds of feed, whether it be slop or dry. The addition of Davis Stock Food to the ration will materially benefit the sow, not only keeping her digestive organs in perfect condition, but improving her appetite; the nux vomica, one of the ingredients, being one of the best tonics known, will keep the system toned up, and consequently keep her in good spirits. The iron and sulphur, both blood-purifiers, will increase the quantity of red corpuscles, thus insuring strong and healthy pigs, while the charcoal is, as every hog breeder knows, one of the best things on earth to feed hogs. It is an intestinal antiseptic and keeps the bowels sweet and clean. One of the greatest dangers to avoid is constipation. The podophyllum, together with the stimulating properties of gentian and nux vomica, will take care of this, and the santonica will, with the other ingredients, keep the bowels free from worms. We think that the swine breeder will agree with us that no more ideal combination could be found. Although feeding at this time will not need to be so heavy as after the pigs are farrowed, it should be liberal. The sow's condition should be good, neither too fat nor too lean. An error which would allow the sow to become fat would perhaps be least productive of serious consequences. It is hardly too much to say that the mistakes in feeding breeding animals are more frequently those that keep such stock in a thin, half starved condition, under the idea that the reproductive organs are so peculiarly liable to become transformed into masses of fat that the least appearance of fat on the animal's back and ribs would be the first step in bringing about such unfortunate circumstances. The use of the reproductive organs in either sex creates demands of an unusual nature on the animal's organism, and these demands must be met in the same manner as those of a different character, such as growth, work, etc., and that is by providing liberal supplies of the proper kinds of feed. It is beyond reason that a sow can give birth to a strong litter of pigs after having gone through a four months' fast.

The importance of ample feeding of pregnant females, in the case of sheep, has been shown recently by Mumford, in Missouri. He found that during the first six to nine weeks of life those lambs having the heaviest girth weight made the greatest gains, the records of the gains of the lambs after weaning were not tabulated. As the development of the fetus is intimately associated with the nutrition of the dam, it is urged that "we can profitably pay more attention to the development of the unborn lamb." Whether a similar fact may be true in the case of hogs is yet to be shown. It may not be unwise

to assume that it may be so. Bad results undoubtedly may be brought about by overfeeding, especially as sows are naturally indolent and loath to exercise; but a counteracting influence will be found in ample exercise that may be provided by a large pasture, or even by driving slowly a mile or two each day. The necessity of exercise must not under any circumstances be overlooked. It must be remembered, in the second place, that the main demands upon the sow are those for the building of new tissue. Hence the kind of feed is important. What are known as the nitrogenous or protein bearing feeds are needed at this time. These are bran, oil meal, peas, beans, oats and barley, and, to a moderate extent, wheat. The forage plants that are especially suitable to pregnant brood sows are the clovers and their relatives, alfalfa, peas, beans, vetches, etc. The ordinary pasture grasses are also of much value. Feed should be given in such form that the system of the sow will be at its best. All breeders lay special emphasis on the condition of the bowels during pregnancy, and particularly at farrowing; the special danger to be avoided being constipation. To this end, the greater part, if not all, of the grain ration is given as slop, and, toward the close of the period of gestation, oil meal or a small amount of flaxseed meal is introduced into the ration. Corn should not be fed in large amounts to breeding stock. If possible, it should not be fed at all to any but fattening animals. In the corn belt many farmers are often so situated that they have no other grain feed at hand. If corn must make up the greater part of the ration of the brood sow, the injurious effects may be counteracted in a measure by compelling the sows to exercise. Various schemes may be necessary to bring about this result, such as having the house and feeding floor or the feeding floor and watering place at opposite ends of the hog lot, so that a good walk is a necessity several times each day. If the lot is located on the hillside, the walk is made a climb. Some men scatter grain among straw and corn fodder with this idea of exercise in mind, and others resort to the whip and drive the sows gently a mile or two each day.

During the winter more care will be needed to keep the sow in good health on account of the absence of pasture. Not only does the hog's system crave green feed, but more or less bulk is demanded. This is especially needed when a considerable amount of confinement is necessary. To offset the lack of green feed, nothing surpasses roots. These may be sliced or pulped and mixed with the grain, or may be given whole as a noon feed. Some care must be used in feeding roots, as they are laxative in effect, and, if fed in excessive amounts, may bring about profuse action of the bowels. Some Eastern farmers recommend the use of silage. If neither is available, clover or alfalfa hay, sheaf oats, or corn fodder may supply the bulky requirements of the ration with good results. Charcoal, ashes and salt should be accessible at all times. These act as a vermifuge and preventive of disease, and meet the hog's craving for mineral matter in the feed. The constant use of such a preparation with a varied ration will, in a large measure, prevent sows from eating their pigs at farrowing time. During the entire period care should be taken to keep the system well toned. The condition of the bowels is highly important; for pregnant and "down" pigging sows are subject to constipation, which may have serious results during farrowing. The sow should become accustomed to being handled and should look upon her attendant as a friend.

All the brood sows may run together up to within two weeks of farrowing time; then it is well to separate them, placing each sow by herself in a yard with a small house such as has been described, which should be dry, airy and clean. A great deal of exercise will not now be necessary. The feed should be reduced somewhat, and, if there is any tendency to constipation, a slight change of feed may be necessary. If individual houses are not available, sows cannot be separated until near farrowing time.

The farrowing pen should be provided with fenders around at least three sides, about 6 or 8 inches from the floor and 6 or 8 inches from the wall. These should be strong enough to support the weight of the sow should she lie on them. They will, in a large measure, protect the pigs from being lain upon during the first few days of their lives. This will go far to prevent a very fruitful cause of loss among young pigs. The little fellows will soon learn to creep under these fenders when the sow lies down. Many breeders now use a specially arranged farrowing pen for sows, the object being to allow the sow room enough to farrow with reasonable comfort, but not enough to turn around. The safety of the pigs under such circumstances is said to be much greater than when the sow is given all the space she cares to take. Provision is made by raising the walls of the pen 6 or 8 inches from the floor. Such a pen may be arranged by placing the sow at one end of her pen and nailing boards across so that she cannot turn, leaving space for the pigs to slip under the barrier. A number of patented farrowing pens are on the market.

Farrowing Time. Sows vary little in the period of gestation. This period is about 112 days from the date of breeding. This date should be known to avoid mistakes that may result in loss of pigs. As the time for farrowing approaches the sow should be watched carefully in order that assistance may be given if necessary. If she has already farrowed a litter, and has been properly fed and cared for during pregnancy, little difficulty may be expected. With young sows, particularly those bred at an immature age, there is a considerable element of risk at this time, not only to the pigs but to the sow herself. The bedding of the sow at farrowing time should be sufficient only for cleanliness and dryness. If furnished in large amounts the pigs will burrow into it and get lost or be crushed. The best bedding is rye straw and wheat straw, and if the straw is cut it makes an almost ideal bed; chaff is excellent if it can be obtained; oat straw is not so valuable.

The management of sows during farrowing will depend largely on the animal and on weather conditions. Assistance should be at hand if needed, but the sow should not be helped if she is getting along nicely alone. Many pigs are lost annually by lack of attention during farrowing; but, on the other hand, there is no doubt that in many cases over anxiety and too much attention may do more harm than good, and often result seriously. The assistance that is imperative at this time is to help in cases of difficult labor, and to protect pigs from chilling in cold weather. The temperament of the sow should be considered; some are plainly annoyed by the presence of an attendant, and show it by their nervous actions; others may be positively ill natured and resent interference. Such sows are better left alone during farrowing, and should be bred to farrow when the warm weather may be expected, so that the chances are as much in favor of the pigs as possible. If the sow's nervousness or ill nature leads her to eat her pigs, the best remedy is to put her in the pork barrel at the earliest opportunity.

When farrowing occurs during warm weather, a minimum amount of attention will be needed. The pigs are less likely to become chilled at this season and will generally find their way to the teats unaided. Proper preliminary feeding of the sow and good quarters will make the chance of trouble small. On the other hand, if a sow farrows during extremely cold weather the pigs will be in danger of being chilled unless the house is heated. To remedy this some breeders throw a blanket over the sow until she is through. Others place a few hot bricks or a soapstone in the bottom of a basket or barrel, covering them with straw and put a cloth over the top to prevent too rapid radiation, and, unless the sow objects too seriously, the pigs are placed in this receptacle as fast as they arrive. They will not suffer if they do not suck for a few minutes and they will be dry and warm when placed to the teats. This treatment will be necessary even in warm weather with sows that are nervous and move about during farrowing. When farrowing is over the pigs should all be placed to the teats, care being taken that each one gets his share. When the afterbirth is passed, it should be removed at once and burned or buried. The hind quarters of the sow should then be washed thoroughly with a good antiseptic solution. For this there is nothing better than Phenalin, manufactured by the Davis Stock Food Co. It is economical and effective, and should always be kept on hand for emergencies. There is good reason to believe that the eating of the afterbirth is often the beginning of the habit of eating the pigs that is so troublesome with some sows.

In very cold weather it may be necessary for a few days to remove the pigs to a warm place after they have sucked, to prevent chilling. As new born pigs suckle as often as every two hours during the day this entails considerable inconvenience, but is time well spent and may mean the difference between profit and loss to the breeder. The pigs are soon able to fight their battle with the cold unaided by any but their own warmth and that of the dam.

For the first twenty-four hours the sow should, as a rule, have no food and will need none. If, however, she shows signs of hunger, a thin slop of bran and shorts or a thin oat meal gruel may be given. Tepid water should be given to drink as the sow wants it. Never give cold water.

The feeding for the first three or four days should be light and carefully given, and the time consumed in getting the sow on full feed should be from a week to ten days, depending on the size and thrift of the litter. The first feed should be very light and in the form of a thin, warm slop, such as is mentioned in the preceding paragraph, working gradually to full feed. Davis Stock Food should be used with religious regularity from now on, as the system is, you must remember, working under full pressure

to supply not only the bodily needs of the sow, but milk for the young, and the supply of milk must be kept up in quality and quantity if good pigs are to be raised. The pen should be cleaned daily if the sow is confined to it.

The Sow a Mother.

No time should be lost after farrowing in getting the sow into the open air. Of course, if the pigs were farrowed during the winter months, care will be needed, and it may be necessary to let the pigs reach the age of two weeks before turning them out. They can, however, get considerable exercise in the piggery or in the lot with the sow, and there is often a lot adjoining the barn that is sunny and sheltered from cold winds where the new family may be turned for exercise. Avoid particularly allowing the pigs to run out during a cold rain. They are especially tender during the first weeks.

The appetite for something besides the dam's milk may begin to assert itself by the time the pigs reach three weeks of age. This time will vary, of course; some pigs being more precocious than others. They will be noticed nibbling at grass, rooting a little, and even investigating the sow's feed. A pen should be arranged adjoining that of the dam, and separated from it by a partition, with sufficient room at the bottom to allow the pigs to run under. In this enclosure put a low, shallow trough, and place in it a little skim milk or a thin gruel similar to that recommended for the sow the first day after farrowing. This gruel may be made with any concentrate that is free from woody matter. If ground barley or oats is fed, the meal should be first sifted to remove the hulls. There is a great variety of feeding stuffs that can be used. The main point to be observed is that the pig's stomach is very easily deranged at this age and feeds must be given that will digest readily. Davis Stock Food in the proportion of 1 teaspoonful to each 2 pounds of feed, should be thoroughly mixed with the feed in the trough so as to obviate the scouring that kills so many pigs, and assist the tender digestive apparatus to take care of the feed, thus insuring the rapid growth and health of the young animal. The trough in which the pigs are fed should be kept clean. No stale feed should be allowed to remain in it from one feed to the next.

As the pigs learn to eat, the feed may be increased. Skim milk should be used liberally, using rather large quantities at first—from 6 to 12 pounds of milk to each pound of grain. During this period comparatively little corn should be fed, as a rule. More growth can be obtained with a narrow ration and the corn should be withheld until the fattening period comes. The pigs should be kept growing constantly, and the best results will come with feeding a little under their capacity rather than all they can consume. To counteract the tendency to become too fat they should have plenty of exercise.

Scours and thumps often cause very serious losses among young pigs. The former is caused usually by overfeeding, by feeding badly spoiled feed, by an abrupt change of feed, or by a change in the feed of the dam that affects her milk. Thumps is generally caused by overfeeding and lack of exercise.

Weaning.

If the pigs have been properly managed for the month after they first begin to eat, and are taking feed in amounts sufficient to make them more or less independent of the sow's milk, weaning will not be a difficult process and will be brought about so that it will be scarcely perceptible, so far as the effects on the pigs are concerned. The time to wean will depend on the way the pigs are eating and the convenience of the breeder. If they are not thoroughly accustomed to grain and skim milk ration, the time must be delayed; and if there is no occasion for breeding the sow, no harm is done by allowing the pigs to run with her to the age of twelve weeks or older. Breeders differ widely as to the age of weaning. The majority wean at six to ten weeks with a considerable number at twelve weeks, some older than twelve weeks, and a few younger than six weeks. The 398 breeders of pure bred hogs, situated in all parts of the country, who stated definitely the ages at which they wean their pigs, reported their practice as follows:

As early as four weeks of age	13
Not before six weeks of age	67
Not before seven weeks of age	2
Not before eight weeks of age	161
Not before nine weeks of age	3
Not before ten weeks of age	93
Not before twelve weeks of age	59

The breeders who wean at the early periods usually are situated where dairy by products are plentiful and they usually raise two litters each year, making the demands of the pigs on the sow as brief and light as possible. Breeders in the corn belt wean at the more mature ages, rarely weaning as young as six weeks, and often allowing the pigs to reach the age of sixteen weeks before the sow is taken away. A considerable number of breeders make no attempt to wean, as the word is generally used; that is, there is no enforced separation of the sow from the pigs; the pigs run with the sow until her instinct tells her that they are old enough to shift for themselves.

The method of weaning will depend somewhat on circumstances. If the pigs are so little dependent on the sow's milk that she is gaining rapidly in flesh and lessening in milk flow, the weaning may be abrupt, and the sow being taken away out of hearing. If she is still milking considerably she may be returned to the pigs once a day for two or three days, or the pigs may be taken away in detachments, beginning with two or three of the largest and strongest, then the next strongest, leaving the weakest ones of the litter to complete the drying off.

Whether the weaning is brought about directly or gradually, it should in all cases be complete and decisive. The pigs should be placed apart from the sows in quarters secure enough to prevent communication, and by no means should pigs be allowed to follow the sow until she is almost worn out. The pigs are no better and the sow infinitely worse than if weaning had been brought about properly.

Feeding the Pigs.

Attention will now be given to the pigs that have been weaned. Up to this time all are on the same feed and under the same management. From now on, however, those that are to be retained as breeding animals should be continued on a growing ration—that is, one which is somewhat narrow and will develop bone and muscle to the largest extent; those that are to be fattened for market should be fed more liberally, and their feed made more carbonaceous.

The Breed- ing Stock.

The foundation on which to build up a successful breeding animal is of ample range, affording an abundance of exercise and a rather narrow ration. Growth should be continuous and feed plentiful. The pigs should not be given range so large and so little feed that they will develop nothing but bone; neither should they have so much to eat that they will become indolent and refuse to take the exercise required to develop necessary bone and muscle. Exercise will strengthen the sinews and develop strong muscles, as well as firm joints and strong legs, while a well filled stomach will nourish these, and from this management we may expect a sow that will be strong, thrifty and a good breeder, and a boar that will do good work in the herd without breaking down in any respect before he should.

Gilts should not be served before the age of eight months, bringing the first litter at twelve months. This gives sufficient time for the development of the reproductive organs.

Fattening.

As soon as it is determined what pigs are to be fed for market, their fattening should be started without delay. Experiments have repeatedly proved that young animals always fatten more economically than old ones, and therefore any delay in finishing is accompanied with a loss. In rare instances it may pay to keep a pig over winter as a "store" hog; but generally he loses the flesh he accumulated while suckling his dam, and this cannot be replaced except at increased expense. Corn will now come into the ration, and should be supplemented by all the variety of feed at the feeder's command, to which Davis Stock Food has been added to keep the appetite keen and the digestive system in the best of condition. This variety should consist of mill feeds, dairy by products and succulent feeds and, according to some authorities, pasture. If skim milk, whey and buttermilk are at command, they can be combined to very good advantage with the ration, commencing with a proportion of about 2 pounds of milk to 1 of grain at weaning time, and reducing the quantity of milk until the pigs are finished on grain alone. A pig gives best returns from dairy by products while young. The fattening pig should gain from 1 to 1½ pounds daily, and should weigh between 250 and 300 pounds at nine or ten months of age. Gains made after this weight are nearly twice as expensive as those made when weighing from 50 to 100 pounds, and a well bred pig finished at a weight of about 250 pounds will very nearly fill the market requirements and bring a satisfactory price.

Selection of Breeding Stock.

The pigs which are to be used for breeding purposes should be selected during the time when the pigs are with the sow. If he is raising hogs for market a breeder will select only sows, castrating all boars. No boar should be used or sold that is not eligible to registry. If the breeder is raising pure bred stock the inferior boars will be culled out and castrated, the others being kept for the breeding market.

The selection should be made as early as possible, depending on the skill of the breeder. That noted feeder, the late Mr. William Watson, used to select his show lambs and calves not later than three days of age. He said an animal had all the development of heart and rib at that age that he would ever get, and his results in the show ring bear out the accuracy of his judgment. However, all are not endowed with the keen insight into animal form that Watson possessed. A selection for a breeding animal should not be made unless there are good and sufficient reasons for it, and unless the breeder is quite sure he is right in making the selection. The sow selected should be from large litters and from dams that are good milkers, and of a quiet, motherly disposition.

Castrating and Spaying.

The boar should be castrated during cool weather, as soon as the testicles descend into the scrotum. An early date is always preferable to a late one, for the development of sex characteristics is of no value to an animal that is intended for meat.

The practice of spaying sows is not very general. It is much more difficult than castration. It often happens that sows which have been impregnated before spaying bear good litters of pigs after that operation.

The age of castration mentioned by correspondents has been tabulated, and it is found that 341 breeders made definite statements as follows:

At or over one week of age	5
At or over two weeks of age	40
At or over three weeks of age	1
At or over four weeks of age	57
At or over six weeks of age	66
At or over eight weeks of age	64
At or over nine weeks of age	2
At or over ten weeks of age	26
At or over twelve weeks of age	80

Management of the Dry Sow.

After the pigs are weaned the dry sows should be placed in a pasture by themselves and given very little grain. Those that show themselves to be prolific and good mothers should be retained as breeders; those having a deficient breeding record or being unsatisfactory in any way should be fattened and sold as soon as possible. It does not pay to keep over a year a sow that cannot raise a large litter, unless she is pure bred and a very exceptional individual.

If a second litter is wanted during a year the sow should be put to the boar during the first heat after weaning. Many breeders do not like to pass many periods of heat for fear that the sow may become "shy;" and there is little reason why the sow should not have two litters a year. In any case, the sow should be carried on comparatively light feed until time to breed again, gaining a little in weight, and their treatment after breeding should be as already detailed.

Management of the Boar.

The management of the boar has been left until this place in the discussion, not because it is an unimportant subject, but because the sows occupy by far the greatest amount of the breeder's attention, and also because it was assumed at the outset of this discussion that the work of a beginner, with only a group of brood sows was being outlined.

When the boar arrives at the farm he should be dipped as a matter of ordinary precaution against the introduction of vermin. As an additional precaution, a quarantine pen should be ready for him, especially if epidemics are prevalent. In short, he should be treated in much the same manner as has

been described for the sow. His feed before change of owners should be known, and either adhered to or changed gradually to suit the new conditions. If he has come a long journey, it will be well to feed lightly until he is well acclimated.

His permanent quarters should be a clean, dry, warm, well lighted and well ventilated pen, 10 or 12 feet square, with a yard adjoining where sows may be brought for service. This yard should be large enough to give him some exercise during the breeding season, when it may be inconvenient to allow him the run of a pasture. Adjoining the yard should be the boar's pasture, from one-half acre to one acre in extent, consisting of clover, alfalfa or good pasture grasses that thrive in the locality.

Breeders generally advocate the practice of keeping a boar to himself during the entire year—out of sight and hearing of the sows. However, a boar is often allowed to run with the sows after they are safe in pig, but during the breeding season it is by far the best policy to keep him by himself, admitting a sow to his yard for mating, and allowing but one service. This will be productive of the best results in many ways. The energies of the male are not overtaxed. He may thus serve a much larger number of sows, and the litters will generally be larger and the pigs stronger. In the case of a sow that is a somewhat shy breeder and a valuable animal, she may be allowed to remain with the boar during the greater part of her heat; but such instances are exceptional. Another advantage of the single service system is that a man always has an accurate knowledge of his breeding operations and knows when to expect farrowing time.

The feed of the boar when not in service may be of a succulent nature, mainly pasture and cut green forage during the summer months, and roots in winter. A boar can hardly be sustained on this alone, and some grain should be allowed to keep him in condition. This should be nitrogenous in character, consisting of mill feeds, such as shorts, middlings and bran, some oil meal, and the leguminous grains, with a little corn. As the breeding season approaches, the feed should be increased, so that the boar will be in good condition. It goes without saying that unless the general health of the boar is the best, that he will not obtain healthy litters nor as large litters. It is therefore important that he receive good, substantial feed of the proper character, and if Davis Stock Food is used with religious regularity it will insure large, healthy litters. While not in service, ample exercise should always be insisted upon, even if it must be urged by the whip. Exercise is productive of well developed muscles and general thrift; with these two conditions activity and soundness of reproductive organs will usually follow. During the breeding season it will not be possible for the boar to get the same amount of exercise, and accordingly care must be taken that his energies are not wasted by unnecessary service. Careful feeding will do much to counteract this disadvantage. It must always be remembered that the drains on a boar during service are severe, especially if fifty or sixty sows are served, and a good tonic and stimulant, such as nux vomica, gentian, and iron, three of the ingredients of Davis Stock Food, will prove invaluable. This will require ample feed with as much exercise as possible, and with care in his treatment will bring about good results. A fully matured boar should not serve more than two sows daily, preferably one in the morning and one in the afternoon, and he can serve fifty or sixty in a season without difficulty. Coburn advises that where farmers own but twelve or fifteen sows each, three or four breeders might purchase a boar and use him in common, thus saving materially in expense. Cownie states that he has found it well to have at least two boars in the herd, even though the herd be small in number.

Sanitation in the Hog Lot.

The greatest drawback to the hog industry which breeders in this country have to contend against is the presence of the highly contagious diseases known as hog cholera and swine plague, or, popularly known as "cholera;" and, were it not for the fecundity of these animals, their profitable production would be out of the question. These two diseases are so closely identical that post mortem examinations are usually required to distinguish between them. Indeed, only recently (on October 1, 1903) DeSchweinitz and Dorset, of the Bureau of Animal Industry, announced the discovery of a fatal disease of hogs which is caused neither by the hog cholera nor swine plague bacilli, and which apparently is a very frequent cause of swine fatalities.

For the present the breeder can regard these diseases as identical, so far as his practical management of the herd is concerned.

There are a few fundamental facts which he must remember if he is to avoid losses by reason of the presence of hog cholera or swine plague in the herd. The first is that they are specific germ diseases, disseminated by bacteria, and the contagion cannot be spread from one animal to another or from one herd to another except by these minute organisms. They may be carried in a multitude of ways—by the hogs themselves, on the clothing of persons, on vehicles, in feed, by dogs, birds and other animals, or by streams. The breeding or feed of a hog cannot cause either disease, although bad methods may so weaken the constitution and vitality that the animal becomes more susceptible than would otherwise be the case; second, diseases by bacteria may be prevented in large part by a thorough disinfection by the regular use of Phenalin; third, bacteria are generally preserved in filth, and therefore scrupulous cleanliness will go far toward preventing outbreaks of disease in herds of hogs.

Prevention of Disease.

Cleanliness.—Preventive measures must be mostly relied upon. Hogs must be given dry and well ventilated quarters, which must be kept clean. Contrary to common belief, hogs have some habits which raise them above other domestic animals from the standpoint of cleanliness. For example, unless compelled to do so, a hog will not sleep in its own filth. If part of the floor of the pen is raised and kept well bedded with straw while the rest is not, all excrement will be left on the unbedded portion of the floor, and the bed itself will always be clean. Feeding and drinking places should be clean and the water supply pure. Unless the origin is known to be uncontaminated, and there has been no possibility of infection during the course, hogs should not be allowed access to streams. Wallows should be kept filled up as much as possible. At least once a month the quarters should be disinfected with air slaked lime or a 5 per cent solution of crude carbolic acid. If a hog dies from any cause the carcass should be burned or buried and pens thoroughly disinfected at once. If Davis Stock Food is fed regularly there can be little danger of disease, because of the functions exercised by the several ingredients, which are antiseptic, atonic and alterative. Hog raisers as a class know that a great percentage of diseases in hogs can be directly traced to constipation and uncleanness. The regular use of Davis Stock Food will keep the bowels in just the right condition.

Breeding and Feeding.—While inbreeding is the surest and quickest means to fix type, the system weakens vitality unless very carefully followed. For this reason closely inbred hogs are more susceptible to cholera than those whose constitutions have not been impaired by the system. The straight corn diet which many hogs receive from one year's end to the other also lessens vitality, and the researches of the Wisconsin Experiment Station have shown that this is probably brought about by actually retarding the development of the vital organs. A minimum of inbreeding and a varied diet, including, especially for breeding stock, ample range, will therefore better enable the herd to resist the attacks of disease.

Isolated Houses.—The advantage of a number of small, portable houses, each accommodating a few hogs, rather than one large piggery for the entire herd, has been referred to in the foregoing pages. In districts where cholera is prevalent these are undoubtedly the best shelters. They make it more difficult to carry contagion to all animals in the herd, and the destruction of one of them in case of an outbreak does not entail a great expense. An added advantage is that they may be moved from place to place as needed. While more work is necessary in feeding, the convenience and safety from their use more than offsets this disadvantage.

Quarantine.—Whenever new animals are brought to the farm, or when animals are brought home from shows, or from neighboring herds, they should be kept apart from the rest of the herd for at least three weeks. If they have been exposed, the disease will manifest itself within that time, and the sick animals can be treated or killed and disposed of at once.

If cholera breaks out in the neighborhood the farmer should maintain a strict quarantine against the infected herd. He should refrain from visits to farms where they are located, and should insist on his neighbors staying out of his hog lot. Intercourse of all kinds at this time should be carefully restricted. The contagion is so easily carried that the strictest measures are justifiable.

All the hog lots should be sprinkled with a solution of Phenalin and the houses thoroughly washed with it. It would also be advisable to whitewash the fences and pens, adding to each gallon of whitewash half a pint of Phenalin.

Treatment of Diseases.

As soon as sickness appears in the herd the unaffected hogs should be at once removed to clean, disinfected quarters, preferably without much range; for by running over pastures they may come in contact with contagion. Their feed should be carefully regulated and, if they have previously been on pasture, should include some green feed, roots, or an abundance of skim milk.

The quarters in which the sickness first appeared should be thoroughly cleaned, all bedding and rubbish burned, and loose boards and old partitions torn out and burned. If the pen is old, knock it to pieces and burn it. Disinfect pens and sleeping places with Phenalin, using air slaked lime on the floors, and the Phenalin solution on the walls and ceilings. Whitewash everything. If a hog dies, burn the carcass or bury it deeply, out of the reach of crows, buzzards or dogs. If possible, do not move the carcass from the place where it falls, but, if this cannot be done, the ground over which it is dragged should be disinfected. Hog cholera bacilli can live in the ground for at least three months. Care must be taken to maintain an absolute quarantine between the sick and well hogs. The same attendant should not care for both lots unless he disinfects himself thoroughly after each visit to the infected hog. Dogs should be confined until the disease is stamped out.

Treatment of hogs suffering from cholera or swine plague is not always satisfactory. The disease runs its course so rapidly that curative measures are more or less ineffectual, and prevention of an outbreak should be relied upon rather than the cure of sick animals.

Dr. Salmon states that the following formula has been successful in less virulent outbreaks when properly administered as soon as signs of sickness are shown:

	Pounds
Wood charcoal.....	1
Sulphur	1
Sodium chloride	2
Sodium bicarbonate	2
Sodium hyposulphite	2
Sodium sulphate.....	1
Antimony sulphide (black antimony)	1

These ingredients should be completely pulverized and thoroughly mixed. In case there is profuse diarrhea the sulphate of sodium may be omitted.

A large tablespoonful once a day for each 200 pounds of live weight of hogs to be treated is a dose. The medicine and Davis Stock Food should be thoroughly mixed with the feed, which should be soft, made of bran and middlings, corn meal and middlings, corn meal and ground and sifted oats, or crushed wheat, mixed with hot water. If the hogs are too sick to come to the feed they should be drenched by pulling the cheek away from the teeth and pouring the medicine in slowly. Care should be exercised, as hogs are easily suffocated by drenching. Do not turn a hog on its back to drench it.

Prevention and Destruction of Vermin.

Hogs often suffer very much from vermin. Lice are introduced from neighboring herds, and the losses in feeding are often severe, especially among young pigs, when death is sometimes a secondary if not an immediate result. When very numerous, lice are a very serious drain on vitality, fattening is prevented, and, in case of exposure to disease, the lousy hogs are much more liable to contract and to succumb to it.

Vermin are most common around the ears, inside the legs and in the folds of the skin on the jowl, sides and flanks. In light and isolated cases they may be destroyed by washing the hogs in a 2 per cent solution of Phenalin. In severe cases, however, especially where the whole herd is affected, thorough spraying or dipping should be resorted to. In this case a dipping tank will be a great convenience.

One of the most effective and cheapest preparations to use as a dip is a 2 per cent solution of Phenalin. If the hogs are washed, apply the solution with a broom; if they are sprayed, use an ordinary spray pump; for dipping, use a dipping tank. When being washed or sprayed, the hogs should stand on a tight board floor.

Newly purchased hogs should be carefully examined for vermin, and they should not be turned with the herd until they are known to be free from these pests.

When the herd is found to be badly infested with lice, all bedding should be burned and loose floors and partitions torn out. Old boards and rubbish should be burned. The quarters should then be thoroughly disinfected by spraying with one of the solutions mentioned (the Phenalin solution is good). After this infection, as in the case of a disease outbreak, everything about the place, inside and out, should be thoroughly whitewashed.

In these remarks on sanitation no attempt has been made to go into the details of the diseases affecting hogs or their treatment. They are simply intended to call attention to the simple measures which may be used by any farmer to avoid to a large extent the decimation of his herd by epidemics. Cleanliness, rational methods of management and Davis Stock Food are relied upon by thousands of farmers to keep their herds in health and vigor. They are the marks of the good farmer and successful hog breeder.

Principles of Hog Feeding.

Food is generally divided into two classes; namely, concentrated foods, and bulky foods. The latter are commonly called coarse fodder, roughage or forage, while under the former classification we have seeds of plants, grain, etc., whole or ground. Vegetables such as pumpkins and the waste fruit of orchards are often fed to hogs and would come under bulky foods. All of these supply, however, a relatively small amount of nutriment. Milk is, properly speaking, a bulky food when fed to mature animals. For young animals whole milk is the most complete food known, but is too expensive to feed to any but the youngest animals.

Relation of Bulky Food to Length of Alimentary Canal.

The amount of bulky food required is different in the various animals, and depends upon the complexity of the food, as well as upon the kind and variety. For example, in a state of nature carnivorous animals, such as the dog and cat tribes, have very short and simple alimentary canals, and live upon flesh, which is a very simple diet. Herbivorous animals, such as the horse, ox, sheep and goat, have the most complicated digestive apparatus; and need a great variety of foods. Between these two classes we have those animals which live on both flesh and vegetable diet. They are known as omnivora. Their alimentary canal is more complicated than the carnivora, but less so than the herbivora. Domestication has to a certain degree changed the habits of all animals considerably, and in doing so has changed the internal characteristics of the body. Pigs are fed almost exclusively on a vegetable diet, only occasionally indulging their appetite for animal diet. As a consequence of this variation in the range of food eaten, these animals have a larger and more complicated digestive tract than the same species in the wild state.

Function of Bulk in the Food.

The function of bulky food is more than the mere furnishing of nutriment, for, in a mechanical way, it aids digestion. In the ruminants especially there is an enormous stomach content, which must be comfortably filled if digestion is to be carried on properly. Hence, with this class of animals a larger amount of hay is required. They give much better returns from a bulky food and subsist much more satisfactorily on it alone than any other animals. While pigs require less bulky food than other domestic animals, recent experiments clearly prove that up to a certain amount the feeding of roughage is very profitable, as it assists the digestion of the more concentrated foods, which have a tendency to derange the digestive system.

Chemical Composition.

From a chemical standpoint the constituents of food that may concern the feeder are the nitrogenous substances, usually termed protein compounds. The starches, sugars, etc., are classed in this book as carbohydrates, and fat found in the analyses is referred to as ether extract. In addition to this, ash is an important constituent of most foods, and should be carefully considered when feeders are making up their rations.

Water Content.

All feeds contain more or less water. The most valuable portion of food is the dry matter. This is what remains of a food after heating it in a drying chamber at or near the boiling point until repeated weighings show no change in weight. While water yields neither tissue nor energy, it enters into the composition of the body, and is, as we know, indispensable. When animals are compelled to take water into the system beyond the normal amount, undesirable results will surely follow. Milk, roots, etc., contain from 80 to 90 per cent water. On the other hand, hay does not ordinarily contain more than 15 to 20 per cent, while dried grains usually contain from 10 to 12 per cent.

Energy.

One thing about food that is being more carefully considered in placing a value thereon is the amount of energy that it will yield. When food is utilized in the animal body a certain amount of heat is evolved, the process not being unlike the consumption of fuel in a furnace. That heat is converted into energy, which is necessary whatever work is performed. It is evident, then, that a horse at hard work will need a ration supplying more energy than one at moderate or light work. The term work, however, has a wider significance than denoting actual muscular effort in the performance of the task—the operations of mastication, deglutition, and the construction of the walls of the stomach and intestines—and involves muscular action both voluntary and involuntary. In the movement of the heart and lungs and the circulation of the fluids in the body, muscular action of some kind is constantly going on. In fact, the performance of nearly every function of the body is actually some form of work involving the expenditure of energy, and accompanied by the evolution of heat and maintained by the energy yielding material in the food. The amount of work performed by an animal in the ordinary process of hustling for a living—that is, finding its own food, eating it and digesting it—is enormous. In experiments with suckling pigs it was found that the young animals required nearly as much energy per square meter of surface as had been found by other investigators to be required by a man at hard work. It is therefore readily apparent that the heat producing powers of food have a very much more important function than the mere maintenance of bodily warmth. In computing the value of a food from a heat producing standpoint, the word calorie is used, which means the amount of heat necessary to raise the temperature of one gram of water one degree centigrade. Fat yields a greater amount of energy than either carbohydrate or protein, there being comparatively little energy given up by protein and carbohydrate.

Relation of Food to the Animal Body.

We have seen that the most important constituents of feedstuffs are the protein, carbohydrates and fats. These, together with the ash, are practically all that the feeder considers in making up his rations.

The following table shows the relation between the constituents of the food and those of the body; that is, to just what part of the body the various foods get.

Disposition of Food in the Body.

Food	Produces in the Body
Water	Water
Proteids	Proteids
Carbohydrates	} Fat.
Fat	
Proteids (rarely)	
Ash	Ash
Fat	} Energy.
Carbohydrates	
Proteids	

It is seen that the water of the food reappears in the water of the body, the proteids of the food become the proteids of the body, the fat of the body is formed by the carbohydrates and fat of the food, and under certain conditions from the proteids. The ash of the body, such as the mineral matter of the bones, comes from the ash of the food. The three principal food constituents, fat, carbohydrates and protein, yield energy in the order named.

As animals have different demands made upon them, we must therefore naturally expect them to require different constituents in their food. To be more explicit, a young and growing animal is building up tissue rapidly, and this should be largely muscular and bony if the best health is to be maintained. Muscular tissue is made up largely of protein. We therefore must see that the food contains a large amount of protein. For the young there should also be a plentiful supply of mineral matter, such as phosphates, so that the bony structure may be properly built up. Nature took care of this in milk. Again, animals that are to be fattened rapidly must have a large amount of fat producing material in the ration, such as carbohydrates or free extract of ether extract. It is for this reason that farmers find corn such a valuable food in fattening. The large amount of energy yielded by fattening rations has an interesting bearing on the shelter requirements. Steers or hogs that are on full feed can enjoy themselves in the coldest weather if provided with a simple shed, although it is apparent that it will be economy to provide them with comfortable, warm quarters, the best temperature for the quarters being approximately 50 degrees Fahrenheit, for while they are able to stay in cold quarters they will consume a large amount of food in heating the body instead of storing it away in fat, and the gains will be that much less.

Digestibility of Foods.

The amount of nutritive material which an animal can get from his food is the all important factor. It is obvious that when skim milk or roots are fed alone immense quantities must be eaten in order to supply a sufficient amount of digestive nutriment. A similar condition is met in foods having a low digestibility, as for instance animals wintered at straw stacks acquire large stomachs by reason of having to gorge themselves with coarse, bulky food in order to get sufficient nutriment to supply the body. Such animals usually present a half starved appearance, because they are not able from such food to obtain an adequate amount of nourishment. We are comparatively safe in stating that not 10 per cent of domestic animals today are capable of extracting all of the digestible nutriment from American feedstuffs; in fact, the majority of them do not obtain over 75 per cent of the available material. It is therefore necessary to feed them from 20 to 25 per cent more food than would be necessary were they able to extract all of the nutriment. To be able to extract all the nutriment everything must, of course, be favorable. The food must be right to begin with, and the conditions and surroundings under which it is fed must be right. Granting all this, then, the animal's system must be working in perfect harmony, it must be blessed with an appetite and enjoy its food, which must be palatable, thus inducing the flow of saliva, the first digestive juice to come in contact with the food, and which has for its function the changing of the starches and sugar. The food then passes into the stomach, carrying with it the saliva, which further exerts its action there. In the stomach the digestive juices perform their function. In order to do so properly all the glands must be working so as to furnish a supply. From here, as the food passes through the alimentary canal, the bile from the liver and the pancreatic juice play their part. From there on the walls are lined with minute glands supplying various digestive juices. All of these must be working perfectly, and once the food is digested the soluble nutriments must be assimilated, which is done by the small capillaries and villi. It is in insuring the efficiency of the digestive system that Davis Stock Food proves its worth. The gentian, nux vomica and iron, all being tonics, provide the animal with a healthy appetite. In addition to this, they have a stimulating action upon the glands producing the various digestive juices, thus increasing their flow. They also assist in the peristaltic movement of the intestines, guarding against constipation. The iron, together with the sulphur, is absorbed by the system, and acts as a blood purifier. The charcoal is an intestinal antiseptic and the santonica keeps the intestinal tract free from worms and parasites.

The Nutri- tive Ratio.

In discussing feeding, the term "nutritive ratio" is frequently met, and it is well for the feeder to become familiar with its meaning. It simply means the ratio between the total amount of digestible protein in a ration (that is, one day's feed) to the total amount of digestible carbohydrates, plus 2.25 times the digestible fat or ether extract. The fat is of greater value for the purpose of yielding energy than the carbohydrates, and chemists have determined that this ratio is about 2.25; hence the reason for this factor in the computation of a ration. As the functions of the fat and the carbohydrates are very similar, the reason is apparent for the addition of the former. There are many publications available that discuss in detail the computation of rations, but they go deeper into the subject than is necessary for the

stockman. One of the principal things to avoid is getting a ration which, while correct, so far as nutritive ratio is concerned, cannot be fed successfully on account of its low digestibility or high water content.

Preparation of Feed and Methods of Feeding.

Investigation of the value of different methods of preparing feed was one of the earliest efforts of the experiment stations made in animal husbandry. The questions that relate to this subject were at once recognized to be of the highest importance and their study very interesting. The subject divides itself into three general sections: (1) cooking, (2) grinding, and (3) wetting or soaking.

Cooking.

The utility of cooking feed for animals, and especially for pigs, was given most attention in the days previous to investigations by experiment stations. The subject demands only brief consideration here. Cooking feed is no longer regarded as an economical practice for fattening animals. However, for breeding stock and sick animals, and for animals which it is desired to put into the very highest condition, cooking may be practiced with good results, if expense is disregarded. Pigs so fed show marked thriftiness and health.

Grinding.

The question whether grain should be fed whole or ground is by no means settled; thus it is one that differs radically from that of cooking, and is of much more importance to feeders.

The Philosophy of Grinding Grain.

The theory of grinding grain is that when the feed is in the condition of a meal it is more readily or quickly available for digestion. It is fallacious to claim that a feed given as meal contains more digestible matter than the same feed before it has been reduced to the condition of meal; for that is a thing that is obviously impossible. But it is not, perhaps, incorrect to say that the digestive fluids may be more effective in their action on feed that has been crushed, or ground, and that less undigested matter is voided by the animal than when whole grain is given. The amount of the feed that is digested and absorbed in its passage through the body, plus the undigested nutrient content of the excrement, practically equals the total digestible matter in the feed before eaten. All practical feeders readily recognize the great possibility of loss by way of excrement when feeding steers on shelled or ear corn, and, to obviate this, they use hogs to consume the waste. Some waste is inevitable. There cannot be perfect feeds or perfect digestions, but we may avoid wasteful methods; and the feeder's problem is to render the loss of feed in the manure as small as possible; and successful feeders are quick to recognize the value of such an article as Davis Stock Food. It is unnecessary to remark that grain which is swallowed without being masticated is much more likely to pass undigested than if thoroughly masticated before swallowing. The kind of grain that is more readily masticated when fed whole would therefore seem to be less in need of grinding than that which is more generally swallowed without thorough mastication. It is interesting to note that the more palatable a ration is, the more thoroughly it is masticated. Davis Stock Food properly used is to the animals' feed what salt and pepper is to ours.

Experiments to Determine the Amount of Undigested Grain.

The Central Experiment Farm, at Ottawa, Canada, conducted experiments to study this subject with pigs. Whole grain was fed and the excrement was collected for one day, the whole grain in it washed and weighed, the weight per bushel estimated, and the germinating power determined. The following table shows the results:

Loss in Feeding Whole Grain.

RATION	Amount Consumed	Amount Unmasticated
	Lbs.	Lbs. Oz.
Oats, soaked 54 hours, all pigs would eat clean, and 3 pounds skimmed milk per head daily	14	2 6
Barley, supplemented as above.....	17	2 2
Peas, supplemented as above	17	2
Indian corn, supplemented as above	11	8

The results of this experiment are very interesting. Note that the amount of grain passed whole is influenced by the size and the kind of the grain; for example, oats and barley were passed in much larger

amounts than peas or corn. It is interesting to compare these results with the tables in the following pages, which show the results of the experiment station work with grinding grain. It is also interesting to note the amount that can be saved by the use of Davis Stock Food when it is used regularly.

EXPERIMENTS WITH GROUND AND UNGROUND GRAIN.

Ground Compared with Whole Corn.—Numerous stations have reported experiments with ground corn compared with whole shelled corn. There is a considerable amount of variation between them, the results in some cases showing as great a loss from grinding as is gained in others. The following table shows results that have been obtained at experiment stations in various parts of the country. Where corn was fed on the cob, the amount is reduced to equivalent weights of shelled corn or not included in the averages:

Results of Experiments with Ground and Unground Corn.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten			Feed per 100 Pounds Gain		
						Whole Grain, Pounds	Meal, Pounds	Milk, Pounds	Whole Grain, Pounds	Meal, Pounds	Milk, Pounds
W. Virginia.											
Corn meal	6	195	361	28	2.15	1,699			471		
Whole corn	3	239	141	28	1.68	819			579		
Corn meal	6	95	581	56	1.73	2,384			410		
Whole shelled corn, soaked	6	95	555	56	1.65	2,138			385		
Kentucky.											
Corn meal	2	100	175	63	1.39	753			430		
Whole corn	2	100	182	63	1.44	780			429		
Corn meal	3	149	113	28	1.35	286			253		
Whole corn	3	196	65	21	1.03	357			549		
Missouri.											
Corn meal	4	160	638	78	2.04	3,196			501		
Whole corn	4	150	594	78	1.90	2,864			482		
Corn meal	4	85	250	116	.54	1,612			645		
Whole corn	4	86	164	116	.35	1,239			755		
Wisconsin.											
Corn meal	10	255	528	30	1.76	2,004	1,002		380	190	
Whole corn	10	251	420	30	1.40	1,815	908		432	216	
Corn meal	9	346	1,348	70	2.13	5,968			443		
Whole corn	9	354	1,235	70	1.96	5,947			481		
Corn meal	10	223	1,076	70	1.53	5,236			487		
Whole corn	10	225	789	70	1.12	4,665			591		
Corn meal	9	210	1,348	84	1.79	5,956			442		
Whole corn	9	212	984	84	1.30	4,926			501		
Corn meal	7	198	576	63	1.30	2,660			462		
Whole corn	7	183	552	63	1.25	2,340			424		
Corn meal	8	187	992	84	1.47	4,698			473		
Whole corn	8	184	830	84	1.23	4,137			500		
Corn meal	8	184	1,030	84	1.53	4,617			448		
Whole corn	8	184	799	84	1.19	3,914			489		
Corn meal	19	186	2,132	84	1.34	10,794			507		

Results of Experiments with Ground and Unground Corn.—Continued.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten			Feed per 100 Pounds Gain		
						Whole Grain, Pounds	Meal, Pounds	Milk, Pounds	Whole Grain, Pounds	Meal, Pounds	Milk, Pounds
Whole corn	19	186	2,136	84	1.34	10,626			497		
Corn meal	14	175	1,938	98	1.41		9,275			479	
Whole corn	14	174	1,571	98	1.15	8,778			559		
Corn meal	12	148	1,038	84	1.03		5,745			553	
Whole corn	12	145	893	84	.89	5,256			588		
Corn meal	3	72	218	84	.89		979			449	
Whole corn	3	70	234	84	.93	1,038			444		
Corn meal	3	80	166	84	.66		961			579	
Whole corn	3	80	169	84	.67	1,004			594		
Corn meal	3	134	274	91	1.00		1,407			513	
Whole corn	3	136	255	91	.93	1,426			559		
Alabama.											
Corn meal	2	78	55	21	1.31		182			330	
Whole corn	2	80	28	21	.66	155			536		
Corn meal	2	172	67	21	1.59		216			323	
Whole corn	2	104	36	21	.85	138			384		
Maine.											
Corn meal	3	86	385	196	.65						
Whole corn	3	86	387	196	.66						
Corn meal	3	165	252	84	1.00						
Whole corn	3	165	271	84	1.08						
New York.											
Corn meal	4	110	253	63	1.00					269	
Corn on cob	4	112	174	63	.69				401		
Ohio.											
Corn meal, cooked	3	191	404	112	1.20		2,386			590	
Corn on cob, cooked	3	202	167	112	.50	2,109			1,260		
Corn meal	3	205	383	112	1.14		2,116			552	
Whole corn	3	199	404	112	1.20	2,039			505		

Average of trials (where total feed is reported) with 297 pigs 524 479

The rations in the first experiment included raw potatoes and skim milk. Those pigs in the second were fed corn meal and water, and corn and water. A supplementary ration to give variety was fed both lots. The feed per 100 pounds gain is dry matter.

The weights of the feed eaten by the lots fed whole corn in these experiments represented equivalent amounts in shelled corn, the weight of the ear corn being thus reduced to show the actual amount eaten. It will be noticed that it took more pounds of whole grain for 100 pounds gain than it did of the corn meal, due undoubtedly to improper mastication, which could have been overcome by the proper use of Davis Stock Food, used as directed with whole grain.

In all but the first test, meal, such as shorts or middlings, was fed to give variety to the ration and give a good appetite and steady gains. It was in the same proportion to both lots in each test.

The results detailed above show a preponderating amount of evidence in favor of corn meal, judging purely from the basis of feed required for 100 pounds of gain and disregarding the expense of grinding. The average for nineteen trials, with 297 pigs, where the amount of feed eaten is reported, is 524 pounds of grain required for 100 pounds of gain when corn is fed whole in the form of shelled corn, and 479 pounds when fed ground, a difference of nearly 8.59 per cent in favor of grinding. This is considerably higher than the value usually given for corn meal, and may be explained to some extent by the

large amount of feed required to make a given amount of gain in some of the experiments, notably the first at the Ohio Station, which must have been due to extraordinary conditions and shows the necessity of a good reliable stock food. Careful researches show that an exact estimate cannot be made of the comparative value of shelled corn and corn meal. It is worthy of particular attention, however, that in these experiments there were only nine instances out of twenty-six where the value of the two feeds was equal to or in favor of whole grain, and in one of the latter, the first Missouri test; although the gains are considerably in favor of the pigs on corn meal, they were more economically made by the pigs on whole corn. The instances that favor whole grain are the main experiments, the first in Ohio, the second in West Virginia, the first in Kentucky, the first in Missouri, and the fifth, eighth, and eleventh in Wisconsin. The researches of Henry, in Wisconsin, have been the most exhaustive that have been undertaken on this subject. All experiments, however, served to illustrate the wide difference in the digestive faculties of individual animals under domestic conditions and emphasize our point that a good stock food composed of known standard roots, herbs, seeds, etc., possessing digestive, tonic and corrective properties is an absolute necessity in economical stock feeding and raising. In the Nineteenth Annual Report of the Wisconsin Station he publishes the following summary of seven years' winter feeding to determine the relative merits of ground and unground corn for fattening hogs. There were 210 hogs fed in all.

Utility of Ground Grains.

YEAR	Number of Pigs in Each Lot	Average Weight at Beginning, Pounds	Condition at Beginning	Saved or Lost
1896	9	350	Thin	8 per cent saved by grinding.
	10	224	Fat	17.6 per cent saved by grinding.
1897	9	211	Rather fat	11 per cent saved by grinding.
	7	190	Rather fat	9 per cent lost by grinding.
1898	8	185	Rather fat	5.4 per cent saved by grinding.
	8	184	Rather fat	8.4 per cent saved by grinding.
1899	19	186	Rather fat	2 per cent lost by grinding.
1900	14	175	Rather fat	15 per cent saved by grinding.
1901	12	146	Rather fat	6 per cent saved by grinding.
	6	71	Fair	1 per cent lost by grinding.
1902	6	80	Fair	3 per cent saved by grinding.
	6	133	Rather fat	8 per cent saved by grinding.

In these experiments no allowance was made for cost of grinding. In nine cases grinding showed a saving of feed, the highest being 17.6 per cent and the lowest 3 per cent. In the three cases where there was a loss, it was 9 per cent, 2 per cent, and 1 per cent, respectively.

Two experiments that have a very close bearing on this subject, but are not included in the above table, are reported from the New Hampshire and Colorado Stations.

In New Hampshire, Burkett compared the feeding values of corn in ear with that of corn and cob meal. The lot receiving whole corn gained an average of 0.81 pound per day, at a cost of 333 pounds grain and 892 pounds skim milk per 100 pounds of gain. The meal fed lot averaged 0.87 pound daily gain, at a cost of 319 pounds of grain and 855 pounds of skim milk per 100 pounds gain, a difference of 4 per cent in favor of grinding. The Colorado Station made six tests with pigs averaging 62 and 63 pounds to compare ground and whole corn. Those on ground corn made an average daily gain of 0.52 pound, consuming 580 pounds of grain and 90 quarts of skim milk for each 100 pounds of gain. The pigs on whole corn made an average daily gain of 0.44 pound, consuming 670 pounds of grain and 120 quarts of skim milk for each 100 pounds of gain.

The only definite conclusion that can be drawn from these figures is that it is beyond anyone to say that an advantage may be expected to follow the feeding of corn meal sufficient to pay the cost of grinding. If corn sells on the open market at 50 cents per bushel of 56 pounds, and grinding costs from 3 to 5 cents per bushel; a saving of 10 per cent by such methods would be very good economy, but if corn falls to 25 cents the cost of grinding must be lessened to make meal feeding profitable.

The importance of doing everything in our power to assist in the proper digestion of the food is, however, brought out with telling force in these experiments, and Davis Stock Food is more than worthy of consideration. In the experiments tabulated greater and more even gains would have been made had it been used and the increased gains would have paid for its use many times over.

Peas.—An experiment with peas is reported from the Central Experiment Farm of Canada, the results of which follow:

Ground Compared with Whole Feeds.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Average Weight at Close, Pounds	Average Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain	
							Grain	Milk
Ground, soaked fifty-four hours	4	62	224	162	126	1.28	276	468
Whole, soaked fifty-four hours	4	100	207	107	84	1.27	333	235

This experiment does not show any difference in the feeding value of ground peas as compared with whole peas, so far as daily gains are concerned, but the pigs on ground peas required 17 per cent less grain than those on whole peas. The results with both feeds were satisfactory.

Grinding Small Grain.—The amount of material available on the subject of grinding small grains is not so voluminous as that pertaining to corn. In the United States a great amount of the oats, wheat, barley, or rye fed, is in the form of mill products and is, of course, ground. These feeds are, moreover, generally used as supplements to corn, and the greater attention has been directed to methods of corn feeding on this account. In common practice, perhaps, these grains are ground more generally than corn, as they are usually much harder. Their greater liability to pass through the animal undigested shows the correctness of this practice.

The following table shows results at five experiment stations, comprising ten tests in all, with a total of sixty-nine pigs:

Effect of Feeding Ground Small Grain.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed Eaten			Feed per 100 Pounds Gain			Cost per 100 Pounds Gain		
						Whole Grain, Pounds	Meal, Pounds	Skim Milk, Pounds	Whole Grain, Pounds	Meal, Pounds	Skim Milk, Pounds	Whole Grain	Meal	
Wisconsin.														
Ground oats, $\frac{1}{3}$; corn meal $\frac{2}{3}$	3	..	457	120	1.27	1839	..	..	403	..	..	..	..	..
Ground oats, $\frac{2}{3}$; corn meal, $\frac{1}{3}$	3	..	371	120	1.03	1593	..	..	429	..	..	..	..	..
Whole oats, $\frac{1}{3}$; corn meal, $\frac{2}{3}$	3	..	296	120	.82	1457	..	..	492	..	..	..	..	..
Whole oats, $\frac{2}{3}$; corn meal, $\frac{1}{3}$	3	..	246	120	.68	1388	..	..	564	..	..	..	..	..
Oregon.														
Chopped oats and wheat,	2	151	331	119	1.39	1603	..	..	484	..	..	..	..	\$5.90
Whole oats and wheat	2	158	308	119	1.29	1830	..	..	594	..	..	..	..	\$7.20
Utah.														
Chopped wheat, dry	2	126	330	135	1.22	1421	..	..	431	..	..	..	..	..
Whole wheat, dry	2	148	332	135	1.23	1474	..	..	444	..	..	..	..	..
Ontario Agri. College.														
Ground peas and barley (1.1)	3	107	390	91	1.43	1589	..	..	407	..	..	..	..	3.87
Whole peas and barley (1.1)	3	109	333	91	1.22	1589	..	..	477	..	..	..	..	4.25

In this experiment the pigs were fed on oats alone for two months, and the experiment was concluded with wheat alone.

Effect of Feeding Ground Small Grain.—Continued.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed Eaten			Feed per 100 Pounds Gain			Cost per 100 Pounds Gain	
						Whole Grain, Pounds	Meal, Pounds	Skim Milk, Pounds	Whole Grain, Pounds	Meal, Pounds	Skim Milk, Pounds	Whole Grain	Meal
Ottawa.													
Peas, barley and rye, ground, soaked twelve hours	5	69	104	119	.87	455			436				
Peas, barley and rye, ground, soaked twelve hours	4	76	134	119	1.12	464	645		346	481			
Peas, barley and rye, whole, soaked forty-eight hours	5	69	87	119	.73	386		445					
Peas, barley and rye, whole, soaked forty-eight hours	5	69	135	119	1.13	330	1,869	246		1,392			
Oats, peas, barley and one-half part bran, ground, dry	4	69	126	119	1.06	450			356				
Oats, peas and barley, whole, dry	4	67	108	119	.90	441		408					
Oats, peas and barley, ground, soaked thirty hours	4	66	124	119	1.04	467			376				
Oats, peas and barley, whole, soaked thirty hours	4	66	105	119	.88	409		388					
Oats, peas and barley, ground, dry	4	101	89	76	1.17	307			343				
Oats, peas and barley, whole, dry	4	103	82	76	1.08	307		360					
Average, ten tests, with sixty-nine pigs									473	415			

The mixture of peas, barley and rye, and oats, peas and barley, fed in these experiments were composed of equal parts of those grains.

The Colorado Station studied the value of grinding both bald, or beardless barley, and common barley. Four tests were made with bald and three with common barley. The pigs on ground bald barley averaged 60 pounds at the beginning, made an average daily gain of 0.75 pound, and consumed 320 pounds of grain and 100 quarts of skim milk for each 100 pounds of gain. Those on whole bald barley averaged 58 pounds at the beginning, made an average daily gain of 0.65 pound, and consumed 370 pounds of grain and 180 quarts of skim milk for each 100 pounds of gain. The pigs on common barley averaged 43 pounds at the beginning. Those on ground grain made an average daily gain of 0.47 pound, and consumed 470 pounds of grain and 90 quarts of skim milk for each 100 pounds of gain. Those on whole grain made an average daily gain of 0.44 pound, and consumed 520 pounds of grain and 90 quarts of skim milk per 100 pounds of gain.

These results show a somewhat wider variation between the feeding values of whole and ground small grain than those from the experiments with corn. It should be also noted that the results are much more uniformly favorable to grinding. The approximate averages are 473 pounds of whole grain per 100 pounds of gain and 415 pounds of ground grain per 100 pounds of gain, showing an advantage in favor of grinding of 12.26 per cent. Davis Stock Food will show 20 per cent greater gains from the same amount of feed. Try it.

Dry Compared with Soaked Feed.

The general custom of soaking grain has received considerable attention from the experiment stations. In some localities a sentiment in favor of feeding meal dry is gaining ground, and some experiments have shown an advantage for this method of feeding. Pigs have been fed to compare wet and dry meal as follows: The Indiana Station fed two lots of pigs on a mixture of equal parts of corn meal and shorts, which, toward the end of the experiment, was changed to hominy meal and shorts. Lot 1 received dry meal and lot 2 received meal mixed with an equal weight of water. Both lots received all the water they desired in addition to that in the feed.

Two tests were made at the Wisconsin Station. In the first a ration of equal parts of corn meal and shorts was fed with water as wanted. In the second trial the grain was two parts of corn meal and one of shorts. Salt and hardwood ashes were supplied to all lots. In both trials lot 1 received dry feed and lot 2 wet feed.

In Minnesota twelve pigs were fed a ration of two parts of corn meal, two parts of shorts and one part of old process linseed meal. Two lots had their meals mixed in a thick slop with cold water, and others were fed dry. At the Missouri Station two lots were fed wheat chop and two others a mixture of four parts whole wheat and one of bran. The wet grain was fed after being soaked thirty-six hours. The pigs, which were high bred Berkshires, were fed in pens open to the south, and they had access to troughs in which was a mixture of hardwood ashes, coal and salt.

In Utah three tests are reported. In the first, two lots were fed a ration of equal parts of wheat and bran in yards; in the second, two lots of pigs were fed a balanced ration of corn meal and bran, which was changed in proportion as age and weight increased; the meal to the wet fed lot was thoroughly mixed with water, but not soaked; in the third experiment, three lots of pigs received a ration of equal parts by weight of bran and chopped wheat. Lot 1 received meal that had been soaked twelve hours; lot 2, meal wet just before feeding; and lot 3, dry meal.

The Oregon Station fed four well bred Berkshire pigs two and one-half months old, at the beginning of the experiments. They received a ration of shorts from July 1st to September 5th, and after the latter date a ration of equal parts by weight of chopped wheat, oats, bran and shorts. The meal to the lot on wet feed was thoroughly wet with cold water and allowed to stand from one feeding time to the next. Charcoal and ashes were given two and three times each week.

A brief experiment of this character that was conducted by a third year student as thesis work at the Ontario Agricultural College is noted in the reports of that institution for 1900. The hogs in both lots were of similar breeding and were fed a meal mixture of wheat and barley.

The Canada Central Experiment Farm fed four lots of pigs on a mixture of equal parts of peas, barley and rye, as follows: Lot 1 received whole grain soaked thirty hours; lot 2 received whole grain dry; lot 3 received ground grain soaked thirty hours, and lot 4 ground grain dry.

The results of these experiments are shown in the following table:

Results of Experiments with Dry and Wet Feed.

RATION	Number of Hogs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten			Feed per 100 Pounds Gain		
						Dry, Pounds	Wet, Pounds	Soaked, Pounds	Dry, Pounds	Wet, Pounds	Soaked, Pounds
Indiana.											
Corn meal or hominy meal and shorts, equal parts. Dry	4	60	634	146	1.08	2,282			359		
Wet	4	59	645	146	1.10	2,451			380		
Wisconsin.											
Corn meal and shorts, equal parts. Dry	3	115	255	68	1.25	1,228			482		
Wet	3	115	337	68	1.65	1,361			402		
Corn, two-thirds; shorts, one-third. Dry	2	169	161	68	1.18	983			611		
Wet	2	169	220	68	1.62	1,040			473		

Results of Experiments with Dry and Wet Feed.—Continued.

RATION	Number of Hogs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten			Feed per 100 Pounds Gain		
						Dry, Pounds	Wet, Pounds	Soaked, Pounds	Dry, Pounds	Wet, Pounds	Soaked, Pounds
Minnesota.											
Corn meal, two; shorts, two; linseed meal (O. P.) one. Dry	3	29	246	112	.73	1,085			441		
Dry	3	33	249	112	.74	1,141			458		
Wet	3	34	342	112	1.02		1,501			438	
Wet	3	30	269	112	.80		1,234			459	
Missouri.											
Wheat chop. Dry	3	111	562	99	1.89	2,340			416		
Wet	3	112	605	99	2.04		2,420			400	
Whole wheat, four-fifths; bran, one-fifth. Dry	3	118	414	99	1.39	2,105			508		
Wet	3	119	373	99	1.26		2,054			550	
Utah.											
Wheat and bran, equal parts. Dry	2	83	296	112	1.32	1,292			436		
Wet	2	69	311	125	1.25		1,462			470	
Corn meal and bran. Dry	3	99	202	75	.90	998			494		
Wet	3	96	171	75	.76		868			508	
Bran and chopped wheat, equal parts. Dry	3	91	216	110	.65	1,389			643		
Wet	3	93	271	110	.82		1,422			525	
Soaked	3	86	234	110	.71			1,360			581
Oregon.											
Mixed grain. Dry	2	63	453	182	1.24	2,116			467		
Wet	2	61	527	182	1.45		2,320			440	
Ontario Agricultural College.											
Wheat and barley. Dry	4			49	1.04				452		
Wet	4			49	.96					489	
Ottawa.											
Peas, wheat, barley, whole. Dry	4	67	432	119	.90	1,764			408		
Wet	4	66	420	119	.88		1,636			388	
Peas, wheat, barley, ground. Dry	4	69	504	119	1.06	1,800			356		
Wet	4	66	496	119	1.04		1,868			376	
Average of twelve tests, with eighty-nine pigs									444	434	

These results show an advantage of slightly over 2 per cent in favor of soaking as compared with feeding dry and would probably have been much greater had a good stomachic in the shape of a reliable stock food been given, thus increasing the flow of digestive juices. The results at Ottawa and in Missouri are worthy of particular notice. Grisdale calls attention to the fact that in the Ottawa experiments a loss is shown by soaking ground grain but the whole grain returned the better gains when fed soaked, and suggests that the results from soaking meal may not be so marked as from soaking whole grain. The Missouri results seem to present contradictory evidence in the second test, where four-fifths of the ration was whole wheat. The Utah results of soaking the meal twelve hours should be noted. They are not included in the average; if this were done the balance would be more favorable to dry feeding.

Two experiments carried on at the Illinois Experiment Station to compare soaked and dry shelled corn gave rather indefinite results. Four pigs fed in pens were used in each case, two being fed on soaked shelled corn and two on dry shelled corn. They had no other food. The first lasted from April 29 to May 27, 1889; the second from June 2 to July 22, 1889. In the second trial the pigs were well fattened when the experiment commenced. Sixty pounds of corn were put in water at one time, at the rate of 1 bushel of shelled corn to about 8 gallons of water, and taken out as needed for feeding. The daily gains favored the pigs on soaked corn in both tests; but in the first test there was an advantage of about 4½ per cent in favor of soaking, while in the second there was an advantage of about 6½ per cent in favor of the pigs on dry corn.

The Effect of Water Content of Slop.

In Indiana, Plumb and Van Norman fed sixteen pure bred pigs, in order to study the effect of water content of slop. The breeds were Chester White and Berkshire. They were divided into four lots of four pigs each, with two of each breed in each lot. They were of September and October farrow, and the feed was equal parts of corn meal and shorts for the greater part of the experiment. For a time hominy meal was substituted for the corn meal. They were fed as follows: Lot 1, dry feed; lot 2, feed mixed with twice its weight of water; lot 3, feed mixed with three times its weight of water. Each lot was given all the water that was desired in addition to that contained in the feed; records were kept of all water drank. Salt and ashes were accessible. Health was good during the entire experiment. The following table shows the results:

Effect of Water Content of Slop Fed to Pigs.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Average Daily Gain, Pounds	Feed per 100 Pounds Gain, Pounds
Meal (dry)	4	60	634	1.08	359
Meal 1, water 1	4	59	645	1.10	380
Meal 1, water 2	4	60	651	1.10	374
Meal 1, water 3	4	60	614	1.05	375

Aside from the apparent advantage in favor of dry feeding, at least in this experiment, the water content seems to have very little influence on the gains when both rate of gain and feed per 100 pounds of grain are considered.

Fermented and Unfermented Bran.

Burkett, in New Hampshire, fed two lots (three in each lot) of Berkshire-Chester White pigs for ninety-nine days, in order to compare the effect of fermented bran in a pig's ration. Lot 1 received fermented bran and skim milk; lot 2 received unfermented bran and skim milk. The bran was steamed in a barrel and left for ten days before it was used. The results follow:

Feeding Fermented and Unfermented Bran to Pigs.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Average Daily Gain, Pounds	Feed per 100 Pounds Gain	
					Grain, Pounds	Milk, Pounds
Fermented bran	3	47	181	.61	291	906
Unfermented bran	3	48	208	.70	322	923

Davis Stock Food added to these rations would have increased the gains to at least 1 pound a day on the same amount of feed. It is said to be the practice of some New Hampshire farmers to allow bran to ferment before it is fed to pigs, and this experiment was conducted in order to test the value of this practice. The pigs on fermented bran seem to have an advantage in the economy of gain, but their gains were smaller.

Wide and Narrow Rations

The Wisconsin Station recently reported four experiments, the object of which was to compare the feeding value of wide and narrow rations. The first compared a ration of equal parts of corn meal and skim milk with one of equal parts of ground peas and wheat middlings plus an equal weight of skim milk. The pigs were

Poland Chinas and large Yorkshires, both breeds being represented in each lot. Each lot had a pen 12 feet square, having a clay floor, and opening into a yard of the same size. Salt and wood ashes were often given.

The second experiment compared a ration of equal parts of corn meal and ground rye with one composed of one-third ground peas and two-thirds wheat shorts. The meal was mixed with water just before feeding and formed a thin slop. The pigs had access to coal ashes and salt, and by subdividing the feeding pen at meal time each pig was fed separately. A pen 12 feet square, with clay floor, and opening into a small yard was allowed each lot. There were ten pigs, two Berkshires, two Poland Chinas, two Yorkshires, and four cross bred Razorback Poland Chinas. These crosses were by an Indian Territory native boar (the typical Razorback of the South), out of a fine boned, short bodied Poland China sow. The two lots were as equal as possible as regards size, age, condition and breed.

In the third experiment pea meal and corn meal were compared. The pigs used were Yorkshires, Berkshires, Razorbacks and crosses of the Razorback with Berkshires and Poland Chinas. They were divided into lots as nearly equal in all respects as possible, and were confined in similar manner to those in the preceding experiments.

The fourth experiment also compared ground peas and corn meal. The pigs were Berkshires, Poland Chinas, Razorbacks and crosses of these large type breeds with Razorbacks. The grain was made into a slop just before feeding time, and the pigs were confined in a similar manner to those in the preceding experiments. Each pig had good ashes and salt and a plentiful supply of water. The following table shows some of the results of these experiments:

Feeding Pigs on Wide and Narrow Rations.

RATION	Total Gain per Head, Pounds	Average Daily Gain, Pounds	Average Daily Amount Grain Eaten, Pounds	Feed per 100 Pounds Gain, Pounds	Digestible Protein in 100 Pounds Feed, Pounds
Wide Ration.					
Corn meal and skim milk	158.76	1.26	3.92	632	3.35
Corn and rye meals	80.8	.96	5.3	552	8.9
Corn meal	117.7	.63	3.07	491	7.9
Corn meal	130.8	.62	3.28	606	7.0
Narrow Ration.					
Peas, middlings and skim milk . . .	147.75	1.17	3.94	681	8.85
Peas and shorts	48.4	.62	4.68	762	13.7
Peas	143.1	.75	3.26	452	16.8
Peas	140.6	.84	4.14	495	16.8

RATION	Digestible Carbohydrates in 100 Pounds Feed, Pounds	Digestible Fat in 100 Pounds Feed, Pounds	Digestible Protein for 100 Pounds Gain, Pounds	Digestible Carbohydrates for 100 Pounds Gain, Pounds	Digestible Fat for 100 Pounds Gain, Pounds	Nutritive Ratio
Wide Ration.						
Corn meal and skim milk	35.85	2.3	33.34	223.41	14.33	1:7.7
Corn and rye meals	67.1	2.7	49.13	370.39	14.90	1:8.2
Corn meal	66.7	4.3	38.789	327.497	21.113	1:9.75
Corn meal	66.7	4.3	47.874	404.202	26.058	1:9.75
Narrow Ration.						
Peas, middlings and skim milk . . .	28.8	1.18	60.14	196.59	8.05	1:3.6
Peas and shorts	50.6	2.7	194.39	385.57	20.57	1:4.1
Peas	51.8	.7	75.936	234.136	3.164	1:3.18
Peas	51.8	.7	83.16	256.41	3.465	1:3.18

During the last two years of pig feeding experiments, where the comparison of breeds was studied, the Iowa Station fed two lots of similarly bred Duroc Jersey pigs to compare wide and narrow rations. The following table shows the results of this station:

Feeding Pigs on Wide and Narrow Rations.

RATION	Number of Pigs	Average Weight Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds
Wide.					
First experiment	5	38	1056	153	1.38
Second experiment	5	22	805	163	.98
Narrow.					
First experiment	5	35	967	153	1.28
Second experiment	5	22	746	163	.92

RATION	Digestible Dry Matter per 100 Pounds Gain, Pounds	Cost of Feed per 100 Pounds Gain	Selling Price per 100 Pounds	Dressed Weight, Per Cent	Nutritive Ratio
Wide.					
First experiment	319	\$1.84	\$3.70	79.3	1:7.8
Second experiment	448	2.23	3.55	77.	1:7.7
Narrow.					
First experiment	328	1.93	3.70	77.1	1:4.1
Second experiment	487	2.68	3.55	74.1	1:4.9

The most striking feature of these results is the advantageous showing of the pigs on the wide rations. In the Wisconsin tests those pigs on corn meal and skim milk made larger, more rapid, and more economical gains than those on peas, middlings, and skim milk, and the same was true of those on corn meal and rye compared with peas and shorts. The rations were not excessively unbalanced in either case, the wide ones being 1:7.7 and 1:8.2 and the narrow ones 1:4.1 and 1:3.6. In both Iowa experiments there is a decided advantage in favor of the pigs receiving the wide rations. They made the largest and most rapid gains, fed more economically, both in feed eaten and money cost of feed, but sold at the same price on the market. The third and fourth Wisconsin experiments gave better returns for peas alone (a narrow ration) than for corn alone (a decidedly wide ration). These tests show, pound for pound, a greater value for peas than for corn, but it is suggested that, considering market prices of feed, corn is the cheaper. The better appetite of the pea fed pigs was remarked upon in both tests, but especially in the last one, and again suggests the advisability of feeding a reliable stock food to increase the appetite and thus be able to turn the stock off quicker. Some investigators have not found peas to be successful when fed alone. Day states that at Guelph, pea feeding resulted in poor gains and unthrifty animals, but feeding a mixture of three parts pea meal and one part middlings gave good gains and produced excellent bacon.

The effect of the narrow rations on the external appearance of the pigs was noted in the Wisconsin experiments. Toward the end of the experiment, when pea meal and shorts were compared with corn meal and rye meal, the luxuriant hair and smoother flesh of the pea fed pigs was remarked upon. The corn fed pigs were less smooth, had deeper wrinkles, and the flesh showed a tendency to be soft and roll over the shoulders and flanks.

Limited Compared With Unlimited Rations. The utility of feeding hogs on a ration which contains a quantity somewhat less than they might consume if the opportunity were afforded, has been studied from two standpoints.

The Value of a Reduced Ration and Davis Stock Food. The market of today demands a finished pig of 175 to 190 pounds weight, with a thickness of fat on the back not to exceed 1½ to 2 inches. It has been demonstrated that such a pig can be produced at a large saving of grain if Davis Stock Food is used in connection. We give an example of what may be accomplished.

Give one lot all the grain they will eat up clean, and the others somewhat less than this amount. The ration of one lot should be 5 pounds of mixed grain and about 3½ pounds of skim milk daily, and that of the others about 4 pounds of mixed grain to which Davis Stock Food has been added in the proportion of 1 tablespoonful to 10 pounds of grain and the same amount of skim milk daily. The following table is submitted as a tentative study of the subject and shows the results obtained in one trial:

Effect of a Slight Reduction in the Ration of Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Average Weight at Close, Pounds	Average Net Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Average Amount Feed Eaten, Pounds	Average Amount Feed per 100 Pounds Gain, Pounds
Full Ration.								
Oats, peas, barley, whole; amount unlimited.....	4	106	182	76	72	1.05	304	400
Skim milk.....							256	334
Limited Ration.								
Oats, peas, barley; amount limited, ground, and Davis Stock Food.....	4	102	198	96	72	1.33	304	306
Skim milk.....							256	256

Although the statement is made that these results are not to be regarded as conclusive, this table affords material for interesting study. The limited ration lots made better net gains, better daily gains, and pork at a less cost of feed per 100 pounds gain than the unlimited ration lot. The influence of Davis Stock Food is plainly apparent on the second lot.

Feeding With a Greatly Reduced Ration.

In Utah, Foster and Merrill made exhaustive studies of the utility of a scanty ration as compared with an unlimited one and also the value of a period of partial starvation followed by one of unlimited feeding. This is obviously a decidedly different problem from that of the Canadian Station. It is held by some feeders that pigs do better on scanty food than on a liberal supply and it is also held that when a period of insufficient nourishment is followed by one of full feeding, the great gains made on full feed more than compensate for the loss while on the light ration.

Effect of Partial Grain Rations With Pasture.

The Utah results show the effect of partial grain rations as compared with full grain rations during five years while pigs were on pasture; also two years' work showing the effect of full feeding following partial feeding, the pigs having pasture during both tests, and also the effect of full feeding following pasture alone. The usual plan was to feed one lot of pigs all the grain they would eat without waste; this is known as a full grain ration. The three-fourths ration, one-half ration, and one-fourth ration were computed from the full ration as a standard. These large reductions put the Utah results on a different basis from those of the Canada Station. The following table shows the results of the five years' work with pigs receiving full and partial grain rations on pasture:

Feeding Pigs on Full Rations and Greatly Reduced Rations.

RATION	Total Gain, Pounds	Average Daily Gain, Pounds	Grain Eaten Daily, Pounds	Grain Per 100 Pounds Gain, Pounds
Full grain ration	299	1.21	4.56	374
Three-fourths ration.....	248	1.01	3.64	354
One-half ration	186	.75	2.83	302
One-fourth ration	119	.55	1.35	247

Following a Limited Ration With Full Feeding.

Foster and Merrill studied the after effects of partial grain rations by placing pigs on full and partial grain rations for a time, and following this period with one in which all the lots had a full ration.

There were six pigs in each lot; they were pure bred and high grade Berkshires, with a few pure bred Poland Chinas; were fourteen weeks old when the experiment began and had run on pasture with their dams. During the experiment they had the run of a good alfalfa pasture. The grain fed was chopped wheat and bran, equal parts by weight. Lot 1 received all the grain they would eat. Lot 2 received three-fourths as much grain as lot 1. Lot 3 received one-half as much grain as lot 1. Lot 4 received one-fourth as much grain as lot 1. The second period began immediately at the close of the first and continued six weeks. During this period the pigs still had the run of the pasture, but all the lots received as much grain as they would eat; that is a full ration.

The following table gives a comparative statement of results of the entire experiment:

Following a Limited Ration With Full Feeding.

RATION	Number of Pigs	Total Weight at Beginning, Pounds	Average Daily Gain, Pounds	Average Amount Grain Eaten Daily, Pounds	Total Feed Eaten, Pounds	Grain Eaten Per 100 Pounds Gain, Pounds	Cost per 100 Pounds Gain	Profit by Periods	Total Profit
Lot 1.									
First period, full grain ration.....	6	259	1.18	3.92	1697	333	\$2.08	\$9.77	\$12.81
Second period, full grain ration....	6	786	1.25	6.21	1697	496	3.10	3.04	
Lot 2.									
First period, three-fourths grain ration.....	6	259	9.14	2.94	1273	322	2.01	7.86	11.79
Second period, full grain ration....	6	654	1.23	5.58	1507	452	2.82	3.93	
Lot 3.									
First period, one-half grain ration.	6	260	.685	1.96	849	286	1.79	6.54	10.38
Second period, full grain ration....	6	556	1.19	5.31	1436	448	2.80	3.84	
Lot 4.									
First period, one-fourth grain ration	6	250	.386	.975	424	254	1.59	4.03	8.19
Second period, full grain ration....	6	417	1.12	.474	1281	421	2.63	4.16	

It will be seen that during the entire experiment the average daily gain varied with the amount of grain received during the first period. The lots receiving the smallest ration during the first period made the cheapest gains but the advantage in the total profits is with lot 1.

Full Rations After Pasture.

The effect of a period of full feeding following one of scanty nourishment is strikingly shown in the Utah results with pigs that went through tests on pasture alone. In 1898 one lot of pigs was on a mixed pasture on which were also some cattle and sheep. A second lot was on alfalfa pasture. No grain was given in either case. The lot on mixed pasture made slight gains. Those on alfalfa changed greatly in appearance during the experiment and lost in weight. At the close of the pasture test the pigs were placed in a pen and fed a full ration of grain and dairy by products. This second period lasted eight weeks.

In 1899 a similar experiment was conducted, the pigs being on alfalfa pasture. Both lots lost in weight. At the close of the pasture test they were placed in pens and fed all the grain they would eat up clean, having the run of the pasture during feeding times. This period lasted forty-four days. One pig in lot 2 failed to thrive and died after the experiment closed. Post mortem examination showed dry and undigested food in the intestines, also the intestines much inflamed. None of these animals had the advantage of a good digestive agent in the form of a reliable stock food and the post mortem emphasizes the necessity of its use.

The following table shows the results of these tests:

Feeding Pigs on Full Grain Rations Following Pasture.

DATA	1898	1899	
	Lots 1 and 2	Lot 1	Lot 2
Total weight at beginning, pounds	601	172	299
Total weight at close, pounds	1,310	358	486
Total gain, pounds	709	186	187
Days fed, number	56	44	44
Average daily gain, pounds	2.11	1.41	1.42
Total feed eaten:			
Milk, pounds	4,101	} a-673	a-862
Whey, pounds	2,751		
Grain, pounds	2,387		
Average amount of feed eaten daily:			
Milk, pounds	12.20	} a- 5.1	a- 6.53
Whey, pounds	8.19		
Grain, pounds	7.10		
Feed per 100 pounds gain:			
Milk, pounds	578	} a-363	a-461
Whey, pounds	388		
Grain, pounds	337		
Cost per 100 pounds gain:			
Milk, dollars	\$0.87	} \$2.26	\$2.89
Whey, dollars	.27		
Grain, dollars	2.11		

a-Grain only.

These experiments seem to point to two conclusions. In the Canadian results a carefully conducted experiment apparently confirms what has frequently been urged by writers on the feeding of both men and the lower animals, namely, that the digestive system will be kept in better tone and will thus be able to do better work if it is not crowded to the limit unless some good digestant such as Davis Stock Food is used. The great forcing to which animals are subjected during the fattening process must surely have an effect that is similar to that of high living in man, namely, a derangement of the digestive and circulatory organs; and it is beginning to be questioned whether this process of compelling a pig or a steer or a sheep to eat up to his limit twice or three times a day for several months is economical, unless the digestive organs are assisted by the addition of some of the well known digestive agents such as gentian, nux vomica, salt, anise, etc. The pigs on a limited ration in the Canadian experiments received an average daily amount of grain of only about one-half pound less than those that were eating all they would clean up, and ate in seventy-six days a total of only 19 pounds less grain. Yet in one case the average daily gain was better, and in both the gains were made more economically—384 pounds grain and 299 pounds milk being required for 100 pounds gain with the unlimited ration lot, while 343 pounds grain and 285 pounds milk and 360 pounds grain and 309 pounds milk, respectively, were required for 100 pounds gain with the two lots on the limited ration. This would seem to be a subject worthy of further investigation.

The Utah results are decidedly against the system of starving animals at any period of their growth. While the economy of the cramming method of feeding may be questioned, no one can doubt that the best results in the fattening of animals will come when they are kept gaining up to the feeding period. These experiments were conducted to test the soundness of the claim made by some feeders that the loss due to feeding extremely light grain rations is more than made up by the large gains made when the animal is given all the grain it will eat, and that a period spent on pasture with little or no grain feeding distends the stomach of hogs by filling them with a mass of bulky feed, and so prepares them to assimilate feed more readily when placed on full grain ration, to eat more feed, and consequently to make larger

and more economical gains. Practically, they were designed to study the utility of a maintenance ration. In the experiment to study the effect of feeding partial grain rations followed by full feeding the pigs on a full grain ration during both periods made the greatest gains through the entire experiment; but the feed per 100 pounds gain and the money cost per 100 pounds gain varied directly with the amount of the daily ration, the pigs receiving the smallest amount making the cheapest gain. However, the profits on the feeding were greatest with those pigs that were not stinted in their feed, except in the second period, when the pigs that had been on partial rations showed the largest profits. The economy of feeding during the early months of a pig's life is thus exemplified. With the pigs that were on pasture alone, the same is true; a summer of stagnation was counterbalanced by a short period of heavy feeding, enormous eating, and very large gains that nevertheless were not sufficient to make the entire feeding process economical.

Corn and Corn Substitutes.

To the farmer of the corn belt those experiments with grains which may take the place of corn for feeding purposes in times of scarcity are always interesting. In seasons such as that of 1901, when a summer of extreme heat and little or no rain follows a spring of normal conditions, the short corn crop is frequently counterbalanced by a bountiful supply of small grains. Many farmers at such times rely on wheat, barley, oats and rye to carry their stock to marketable condition. Outside the corn growing districts such experiments are of even more importance, for the small grains are often grown in great abundance and form the basis of all rations.

Wheat Compared with Corn.—At the Indiana Station, Plumb and Anderson fed four lots of Chester White pigs, to study the relative value of feeding corn and wheat, both alone and in combination. The pigs were farrowed late in October, and the experiments began as soon as they were weaned, which was early in January. They were out of two sows that were litter sisters. Lot 1 received whole corn; lot 2 received dry whole wheat; lot 3 received a ration consisting of equal parts of corn and wheat; lot 4 received soaked whole wheat.

Up to March 6th they received 10 pounds of separator milk as a noon feed and after that date 12 pounds of the same daily. They were fed 105 days. The results were as follows:

Wheat Compared with Corn for Pigs.

Lot	RATION	Number of Pigs	Weight at Beginning, Pounds	Weight at Close, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Pounds Feed per 100 Pounds Gain
1	Corn	4	185	673	105	1.16	312
2	Wheat, dry	4	175	607	105	1.02	355
3	Corn and wheat, equal parts	4	174	646	105	1.12	323
4	Wheat, soaked	4	189	633	105	1.05	355

At the Utah Station, Foster and Merrill conducted similar work in comparing ground wheat with corn meal. Two lots of three pigs each were fed, in covered pens, all the ground grain they would eat. The results follow:

Ground Wheat Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Weight at Beginning, Pounds	Weight at Close, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Pounds Feed per 100 Pounds Gain
Corn meal	3	290	519	91	.85	558
Ground wheat	3	291	615	91	1.20	464

At the usual price of corn and wheat, 75 cents per hundred weight, the cost of gain for the corn fed lot is given as \$4.18 per 100 pounds, and that of the wheat fed lot at \$3.48 per 100 pounds. At least 25 per cent greater gains can be made with the same amount of feed if Davis Stock Food is fed for the

full feeding period and the gains in these cases would not have cost over \$3.25 and \$2.75 per 100 pounds, respectively, had it been used.

At the close of this test a second one was made, but the ration of the first lot was made equal parts of corn meal and pea meal after the middle of the test. The results follow:

Ground Wheat Compared with Corn and Pea Meals for Pigs.

RATION	Number of Pigs	Weight at Beginning, Pounds	Weight at Close, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain, Pounds
Corn and pea meals	3	260	670	115	1.12	407
Ground wheat	3	257	587	115	.96	403

Wheat Compared with Various Other Grains.—At the Nebraska Station, Smith fed eight lots of six pigs each to study the comparative feeding value of wheat, rye and corn, both alone and in combination. Charcoal and lime were fed occasionally. Four pigs in each lot were of the bacon type, Tamworth and Yorkshire, and two were of the fat, or lard type, or block type, as the author expresses it. Each lot had an 8x12-foot cement floored pen in a closed shed, with an 8x16-foot yard adjoining. The ground feed was mixed into a thick slop after being weighed; the soaked wheat was weighed before being soaked. The first cost of the pigs was \$4.50 per 100 pounds and they were sold on the farm at \$5.52½ per 100 pounds. Corn and wheat were charged at 55 cents per bushel, rye at 50 cents per bushel, and shorts at \$18.00 per ton. Grinding was charged at 8 cents per 100 pounds for wheat and rye and 6 cents per 100 pounds for corn. A statement of the results follows:

Wheat Compared with Other Grain for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Average Weight at Close, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten, Pounds	Feed per 100 Pounds Gain, Pounds	Profit per Lot
Whole wheat, dry.	6	110	167	342	91	.63	2,178	637	\$5.72
Whole wheat, soaked eighteen to twenty-four hours	6	110	174	385	91	.70	2,210	575	7.81
Ground wheat.	6	108	177	414	91	.76	2,317	559	6.43
Ground wheat and corn, equal parts	6	111	178	401	91	.74	2,351	586	6.03
Ground wheat and rye, equal parts	6	107	170.7	383	91	.70	2,376	621	4.34
Ground wheat and shorts, equal parts	6	109	174	388	91	.71	2,375	612	5.65
Ground corn	6	110	174.5	387	91	.71	2,356	609	3.60
Ground rye	6	107	168	367	91	.67	2,290	624	4.55

In this experiment the ground wheat gave the greatest returns for the least amount of grain, but did not return so large a profit as whole soaked wheat, owing to the expense of grinding. The undesirability of feeding whole wheat dry seems to be indicated by these results. Ground wheat and corn gave considerably better returns than ground wheat and rye or ground wheat and shorts. Ground corn and rye alone do not appear to advantage.

These results show wheat to have a feeding value fully equal to that of corn, and are in line with the work that has previously been published on this subject. In the first Utah test, wheat showed a very much better and cheaper gain than corn, but when pea meal was added to the corn meal ration wheat did not have so great an advantage. The Nebraska results are especially favorable to wheat feeding.

Feeding Frosted Wheat.

Nine experiments with wheat that had been more or less damaged by frost were conducted at the Central Experiment Farm in Canada. The grain was fed alone, ground, unground and in combination with other grains and skim milk. The following shows the results and conclusions from the experiments:

Frosted Wheat for Pigs.

Experiment	RATION	HOW PREPARED	Number of Pigs	Average Weight at Beginning, Pounds	Average Weight at Close, Pounds	Average Net Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Average Amount Feed Eaten, Pounds	Feed per 100 Pounds Gain, Pounds
1	Wheat	Ground, soaked twelve hours	4	185	275	90	77	1.17	479	530
2	Wheat	Whole, soaked forty-two hours	4	186	273	86	77	1.11	570	659
3	Wheat, barley and peas	Whole, soaked forty-two hours	4	187	278	92	77	1.19	557	607
4	Wheat	Ground, soaked twelve hours	5	61	165	104	120	.87	441	423
5	Wheat	Ground, soaked five hours	4	104	192	88	56	1.57	233	265
	Skim milk .....	.....	.....	.....	.....	.....	.....	.....	1,011	1,251
6	Wheat	Ground, soaked eighteen hours	12	103	187	84	84	1.00	442	526
7	Wheat and barley	Ground, soaked thirty hours	21	117	179	62	84	.73	326	445
	Carrots .....	.....	.....	.....	.....	.....	.....	.....	53	85
8	Barley, wheat, rye and bran	Ground and soaked twelve hours	36	54	108	54	105	.51	207	385
9	Barley, wheat, rye and bran	Ground and soaked twelve hours	31	108	191	83	83	1.00	268	323
	Skim milk .....	.....	.....	.....	.....	.....	.....	.....	250	300

The fact that this wheat had been injured by frost does not seem to have had a serious effect on its feeding value. In the majority of instances the gains made were satisfactory, and those cases in which a large amount of grain was required for 100 pounds of gain were generally with hogs of considerable maturity and consequently expensive feeders.

Barley Compared with Corn.—The following results were obtained with barley alone in comparison with corn alone in South Dakota, Colorado and Canada:

Barley Compared with Corn for Pigs.

RATION	No. of Tests	No. of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain		
							Corn, Pounds	Barley, Pounds	Milk, Pounds
Colorado.									
Whole corn	6	.....	71	.....	.....	.39	700	.....	110
Ground corn	5	.....	60	.....	.....	.46	540	.....	110
Whole bald barley	8	.....	88	.....	.....	.58	.....	500	130
Ground bald barley	5	.....	67	.....	.....	.74	.....	360	80
Whole common barley	4	.....	68	.....	.....	.49	.....	540	70
Ground common barley	4	.....	47	.....	.....	.70	.....	430	110

Barley Compared with Corn for Pigs—Continued.

RATION	No. of Tests	No. of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain		
							Corn, Pounds	Barley, Pounds	Milk, Pounds
South Dakota.									
Corn meal	1	5	126	430	56	1.53	453	.....	.....
Barley	2	9	112	803	56	1.59	.....	457	.....
Ontario Agricultural College.									
Corn .....	.....	.....	.....	.....	.....	.70	547	.....	.....
Barley .....	.....	.....	.....	.....	.....	1.17	.....	456	.....
Central Experimental Farm, Ottawa.									
Whole corn	1	3	72	354	91	1.30	290	.....	231
Ground corn	1	4	74	392	112	.87	416	.....	.....
Whole barley	1	4	99	400	84	1.19	.....	364	252
Ground barley	1	4	73	444	112	1.00	.....	435	.....

This table does not present an accurate comparison between barley and corn, as skim milk enters into the results in five instances when barley was fed, as against only three instances when corn was fed, but the results command interest in showing that the value of barley for hog feeding compares favorably with that of corn.

Barley Compared with Corn in Combinations.—The South Dakota Experiment Station and the Ontario Agricultural College have reported tests with barley in combination with such feeds as shorts and middlings. The following table shows the results:

Barley Compared with Corn in Combination for Pigs.

RATION	Number of Tests	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain, Pounds	
							Corn	Barley
South Dakota.								
Corn and shorts, equal parts	2	9	111	840	56	1.67	413	.....
Barley and shorts, equal parts	4	17	115	1,561	56	1.64	.....	456
Ontario Agricultural College.								
Corn and middlings	1	11	63	.....	.....	.79	480	.....
Corn and middlings	1	12	.....	.....	140	.817	432	.....
Corn and middlings	1	5	55	664	.....	.667	424.55	.....
Barley and middlings	1	13	63	.....	.....	.80	.....	490
Barley and middlings	1	12	.....	.....	140	.841	.....	430
Barley and middlings	1	4	42	501	.....	.639	.....	439.22

These results are not so favorable to barley as those of the preceding table, but it can also be said, in the light of these figures, that barley is nearly if not quite equal to corn for feeding pigs (but the use of a good digestive powder or food will make it fully as valuable), judging it solely from the standpoint of rate and economy of gain, and, if we take into consideration its effects on the carcass, it far surpasses corn as a high grade pig's feed. An experiment with pure bred hogs at the Ontario Agricultural College, which is not included in the foregoing table, compared barley and corn. Some middlings and skim milk were given, but during the last month the grains were fed alone. While receiving middlings and skim milk the pigs on corn made the most economical gains, but after the middlings and skim milk were withdrawn the pigs on barley made the most rapid and economical gains. The experience of this institution places barley at the head of the list of American bacon producing feeds.

Ground Wheat and Barley Compared with Shelled Corn.—At the Colorado Station, Buffum and Griffith fed two lots of pigs to compare the feeding value of home grown Colorado grain with corn,

which must be imported from states farther east. The pigs used were rather ordinary grade Poland Chinas and Berkshires, about eight months old at the beginning of the experiment. One lot was fed shelled corn; the other, a mixture of equal parts of ground wheat and barley. The wheat and barley were grown on the college farm. The wheat was the common Defiance variety and was grown in a field producing 34 bushels per acre. The barley was of the common hulled variety and was grown in a field that produced 25 bushels per acre.

The pigs were kept in pens of equal size, each pen with a yard adjoining. The pens were well bedded with straw. Water was given in abundance, and occasionally coal and ashes. The following table shows the results:

Ground Wheat and Barley Compared with Shelled Corn for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Average Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Average Amount of Feed Eaten, Pounds		Feed per 100 Pounds Gain, Pounds		Cost per 100 Pounds Gain	Profit at 7 Cents Per Pound
						Corn	Wheat and Barley	Corn	Wheat and Barley		
Corn	4	95	71.25	101	.70	383.50	.....	540	.....	\$7.00	\$0.95
Wheat and barley	4	94.5	120.25	104	1.16	.....	546.50	.....	450	4.50	3.90

This experiment shows a mixture of wheat and barley to be much more valuable than corn alone for pig feeding. It also speaks very well for the economy of pork production in those states where corn is not a staple crop. Buffum and Griffith state that it is a common practice in the neighborhood of Fort Collins for farmers to exchange barley or wheat for corn on even terms, and, even when corn is high in price and wheat and barley cheaper, they will sell the cheaper home grown grains and buy the expensive one. They give the average price for ten years of these grains in Colorado as 80.5 cents per 100 pounds for corn, 99.5 cents per 100 pounds for wheat, and 55.1 cents per 100 pounds for barley. They ask, very pertinently, whether Colorado feeders have not the solution of the problem of a supply of concentrates for pork production when home grown grain sells on the farm for less money per 100 pounds than corn can be purchased in town, and especially when either wheat or barley is equal to corn for this purpose, and in combination are superior to it.

Oats Compared with Corn.—Grisdale reports a comparison of oats and corn. The grain was fed whole and was soaked fifty-four hours before feeding. Both lots received skim milk in addition. The results were as follows:

Oats Compared with Corn for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Average Weight at Close, Pounds	Average Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain	
							Grain, Pounds	Milk, Pounds
Oats	4	97	170	73	84	.87	421	345
Corn	3	72	190	118	91	1.30	290	231

The results of this test are not very favorable to oats as a pig feed, due in a large measure to the hulls of oats being very indigestible, and no stock food was used in this experiment. To get even as economical a gain as could be had from corn a feeder would have to get nearly twice as good gains as from the oats; for, pound for pound of nutrient material, oats are about twice as expensive as corn.

Corn and Kaffir Corn.—The Oklahoma Station compared Indian corn and Kaffir corn as follows: Six pigs, averaging about 135 pounds at the beginning of the test, were fed six weeks on Kaffir heads, and made an average daily gain of 1.11 pounds, requiring about 665 pounds of grain for 100 pounds of gain. Three pigs, averaging 220 pounds at the beginning, made an average daily gain of 1.53 pounds for thirty-five days, and required the equivalent of 494 pounds of shelled corn for 100 pounds of gain. These same pigs were then fed Kaffir meal for two weeks and made 1 pound of gain per head daily, eating 921 pounds of meal for each 100 pounds of gain.

Four pigs, averaging 105 pounds, were fed thirty-five days on Kaffir meal. They made an average daily gain of 1.21 pounds, eating 508 pounds of meal for 100 pounds of gain. For the next two weeks they were given soaked shelled corn. They made a total gain of only 30 pounds, eating 707 pounds of corn for 100 pounds of gain. For the next four weeks a daily supply of green alfalfa was given with good effect. A total gain of 140 pounds was made, requiring 365 pounds of grain for 100 pounds of gain.

Kaffir Corn.—The value of Kaffir corn for hogs has been studied extensively at the Kansas Station. Kaffir corn was found to have a feeding value considerably below that of Indian corn when both grains were fed alone. In Bulletin No. 95, Cottrell states that the average of a number of trials shows that 527 pounds of Kaffir corn and 468 pounds of Indian corn, respectively, are required per 100 pounds of pork made; the yield of pork per bushel of grain being 10.6 pounds in case of Kaffir corn and 11.9 pounds with Indian corn. Davis Stock Food, properly used, would have increased the gain at least 20 per cent in either case. On upland soil, however, the average of eleven years on the Kansas Agricultural College Farm shows returns of 46 bushels per acre for Kaffir corn and 34½ bushels for Indian corn. Such returns, with gains as noted above, indicate a pork yield per acre of grain at 487 pounds for Kaffir corn and 410 pounds for Indian corn. The great value of Kaffir corn is its ability to resist drouth.

Soy Beans in a Kaffir Corn Ration.—In addition to the lighter returns from Kaffir corn than from Indian corn, this grain is very constipating when fed alone, and hogs, especially young ones, tire of it sooner than they do of Indian corn. To remedy these difficulties a mixture is advised, especially with feeds of a laxative nature. One of the most convenient nitrogenous concentrates at the hands of the Kansas farmer is the soy bean. The effect of eating soy beans is good. Hogs receiving them fatten rapidly, look thrifty, have strong appetites, and the hair and skin are glossy, like those of animals fed on oil meal.

The following summary gives a more elaborate comparison of the relative values of Kaffir or Indian corn meal alone and in comparison with soy beans. The results are arranged in order of economy of gains, the total showing the number of pounds of feed required for 100 pounds of gain.

Value of Soy Beans in a Kaffir Corn or Indian Corn Ration.

RATION	Feed per 100 Pounds Gain, Pounds	RATION	Feed per 100 Pounds Gain, Pounds
Corn meal, two-thirds; soy bean meal, one-third	369	Shelled corn, dry	479
Kaffir corn meal, two-thirds; soy bean meal, one-third	374	Kaffir corn meal, soaked forty-eight hours	542
Kaffir corn meal, four-fifths; soy bean meal, one-fifth	408	Kaffir corn, whole, soaked forty-eight hours	550
Kaffir corn meal, four-fifths; soy bean meal, one-fifth	435	Kaffir corn meal, wet	559
Kaffir corn meal, one-half; corn meal, one-half	456	Kaffir corn, whole, soaked forty-eight hours	632
Shelled corn, dry	457	Kaffir corn, whole, wet	638
Kaffir corn meal, four-fifths; soy bean meal, one-fifth	468	Kaffir corn, whole, wet	640
Kaffir corn meal, wet	471	Kaffir corn meal, wet	653
Kaffir corn meal, one-half; corn meal, one-half, wet	477	Kaffir corn, whole, dry	655
		Kaffir corn meal, wet	691
		Kaffir corn meal, dry	749
		Average	528

The six lots of pigs having soy beans as part of their ration required an average of 411 pounds of grain for 100 pounds of gain, while the nineteen lots not fed soy beans required an average of 546 pounds of feed for 100 pounds of gain, an increase in feed required of over 37 per cent.

Peas Compared with Wheat.—The Utah Station compared the value of peas and wheat during two years. The pigs were confined in yards and the grain was given whole and dry. The average of results was as follows:

Peas Compared with Wheat for Pigs.

RATION	Total Weight at Beginning, Pounds	Total Gain, Pounds	Feed per 100 Pounds Gain, Pounds
Peas	147	303	452
Wheat	136	282	476

Cow Peas Compared with Corn Alone.—At the South Carolina Station, Newman and Pickett fed to compare cow peas with corn. The pigs were from eight to eleven months old and were fed in pens. There were three pigs in each lot.

The cow pea fed lot ate 6.7 pounds of cow peas per head daily and made an average daily gain for the lot of 3.38 pounds. They required 491 pounds of cow peas to produce 100 pounds of gain.

The corn fed lot ate 9.2 pounds of corn per head daily and made an average daily gain for the lot of 4.17 pounds. They required 602 pounds of corn to produce 100 pounds of gain.

With pork at 5 cents per pound and corn and cow peas yielding 15 bushels and 10 bushels, respectively, per acre, the value of an acre of corn in this experiment was \$6.97 and that of an acre of cow peas \$6.12.

Ground Cow Peas and Corn Meal Compared with Corn Meal.—At the Alabama Station, Duggar fed two lots of pigs to compare the relative value of a ration of half corn meal and half ground peas with an exclusive corn meal ration. The pigs used were placed in covered pens, with small yards adjoining, and after a preliminary period of a week were put into the experiment, which lasted sixty days. The results are as follows:

Ground Cow Peas and Corn Meal Compared with Corn Meal for Pigs.

RATION	Gain, Pounds	Number of Days Fed	Feed Eaten, Pounds	Feed per 100 Pounds Gain, Pounds
Ground corn alone	68	60	548	806
Corn, one-half; cow peas, one-half	108	60	570	528

In this experiment the cow pea and corn meal ration made gains 34 per cent more economical than corn alone. The quality of the pork made was as good as that of corn fed pork.

Peanuts Compared with Corn Meal.—Duggar placed in pens the pigs used to compare the value of peanut pasture and corn meal to make a more accurate study of the nutritive values of Spanish peanuts and corn meal. The lots received the same rations, except that the peanuts were dry and fed unhulled. The test lasted six weeks, with the following results:

Peanuts Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Number of Days Fed	Total Gain, Pounds	Average Daily Gain, Pounds	Feed per 100 Pounds Gain, Pounds
Peanuts, one-half; corn meal, one-half	3	42	84	.67	370
Peanuts only	3	42	59.5	.47	280
Corn meal only	2	42	8.6	.10	1,070

This experiment shows the best daily gains from the combination of peanuts and corn meal, and shows the best returns for feed eaten by the pigs on peanuts alone. This lot made very much better

gains than the pigs fed exclusively on corn meal, which fed very poorly. The pigs on peanuts alone made a gain of 9 pounds per bushel of peanuts. This gives a value of 27 cents to a bushel of Spanish peanuts when pork is worth 3 cents per pound gross, and 31½ cents when pork is worth 3½ cents per pound. The unthrifty appearance of the pigs fed on corn meal only was commented upon.

At the South Carolina Station, Newman and Pickett fed two lots of grade Berkshire and Duroc Jersey pigs, from eight to eleven months old, in pens, to study the relative value of peanuts and corn. On land of similar character they estimated the corn yield at 15 bushels per acre and peanuts 90 bushels, and in their investigations they found that with exclusive corn feeding, 602 pounds of corn were required for 100 pounds of gain, and with peanuts, 443 pounds for 100 pounds of gain. On this basis an acre of corn will produce 140 pounds of pork and an acre of peanuts 488 pounds, worth, respectively, when pork is 5 cents a pound, \$6.97 and \$24.37.

Commercial By Products.

One of the prominent features of modern industry is the development of the possibilities of the by product—the waste and offal of manufacturing establishments. Farmers have long appreciated the value of the by products of flour mills, but of recent years many other materials have come into the markets as valuable feed for farm animals. Rice mills, oil mills, and packing houses all have their by products, which are useful in supplementing the products of the farm.

Milling By Products.

The by products of the flour mills have for years been bought by the farmers for use in the feed box, and one of these, middlings, has come to have an unsurpassed reputation for hog feeding, especially for young animals in the early stages of fattening. With the development of milling, the ingenuity of the manufacturer has enabled him to throw a host of new feeds upon the market. In consequence, we have, in the first place, a by product more completely deprived of its nutrient material, perhaps, than formerly, but more uniform in quality; and, in the second place, a greater variety of feeds with which to supply the bins. It is not alone the by products of the flour mills that have value for feeding purposes. The rice mills, glucose factories, and oil mills, all have by products that are useful adjuncts to feeding operations. Indeed, most of the experimental work of recent years deals with the value of the by products of these industries. In the majority of instances these feedstuffs are best used as adjuncts to corn or corn meal, although often a proximity of feed yards to a mill cheapens the by products sufficiently to enable the feeder to use them as the main part of the ration.

Bran and Corn Meal Compared with Corn Meal.—Burkett fed two lots of three pigs each, one receiving a ration of equal parts of bran and corn meal and milk, and the other corn meal and milk. The object was to compare the value of bran in such a ration and have the corn fed lot as a check. The results follow:

Bran and Corn Meal Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed per 100 Pounds Gain	
						Grain, Pounds	Milk, Pounds
Bran and corn meal	3	47.6	227	99	.76	308	882
Corn meal	3	47	323	99	1.08	263	663

This experiment gave much better returns for a corn meal and skim milk ration than for one where bran was added, because of the difficulty an animal has in digesting bran. Davis Stock Food should be added to all rations, and it will more than pay for itself in the feed saved.

Shorts Compared with Corn.—At the Colorado Station, Buffum and Griffith fed pure bred Berkshire pigs, about five months old, to compare the feeding value of corn meal and shorts in combination with wheat, barley and oats. One lot received shorts, wheat, oats and barley in rotation—shorts with wheat and oats one day, with wheat and barley the next, with oats and barley the next, and so on. The lot on corn had the same method of feeding and the same ration, except that corn was fed in place of shorts. Feed was charged at the following prices: Corn, 83 cents per 100 pounds; shorts, 75 cents per 100 pounds; wheat, 95 cents per 100 pounds; oats, \$1.20 per 100 pounds; barley, \$1.20 per 100

pounds. The experiment lasted from March 21 to May 31, 1901, sixty-nine days, the results being as follows:

Shorts Compared with Corn in Mixed Rations for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Average Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Average Amount Feed Eaten			Feed per 100 Pounds Gain, Pounds	Cost per 100 Pounds Gain
						Corn, Pounds	Shorts, Pounds	Other Grain, Pounds		
Shorts and grain	3	112.5	88.2	69	1.31	.....	226.5	225.6	521	\$4.70
Corn and other grains	3	98	85.6	69	1.27	208.6	.....	209.1	487	4.70

At the Indiana Station, Plumb and Anderson fed two lots of high bred Chester White gilts, each five and one-half months old, to compare the value of a ration of corn meal and wheat shorts with the ration of corn meal only. The mixture was equal parts by weight of corn meal and shorts. The pigs were fed in pens with small shelter houses attached. Shorts were valued at \$14.00 per ton and corn meal at \$13.50 per ton. The results were as follows:

Feeding Value of Wheat Shorts.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten		Feed per 100 Pounds Gain, Pounds	Cost of Feed per 100 Pounds Gain
						Shorts, Pounds	Corn Meal, Pounds		
Shorts and corn meal	3	129	354	70	1.69	718	718	406	\$2.74
Corn meal	3	129	327	70	1.56	.....	1,413	432	2.80

The mixture of corn meal and shorts gave larger, more rapid and more economical gains than a ration of corn meal only. In the Colorado experiment the pigs fed on a ration of shorts made larger and more rapid gains than those on corn meal, but they required more feed per 100 pounds gain.

Corn Meal Compared with Rice Meal.—The South Carolina Station compared rice meal and corn meal. The rice meal is a by product of the rice mills and consists largely of rice flour, rice polish and rice bran. As yet the mills have no uniform way of putting it on the market, and in order that the reader may understand what is meant by rice meal, as used in this experiment, it may be said that it is all the by product in cleaning the rice grain for the market. Its chemical composition shows that it has about the same amount of protein, carbohydrates and fat as corn meal.

The pigs used were Berkshires, about five months old, weighing about 90 pounds each. They were given a ration consisting of one part meal and four parts skim milk, the milk being mixed with meal, and were confined in pens 20 by 40 feet, with plenty of shade.

The experiment was divided into two periods. During the first period of thirty-nine days, lot 1 was fed the corn meal ration, and lot 2 the rice meal ration. During the second period of twenty-two days the feed was reversed, lot 1 having rice meal and lot 2 corn meal. The results during the first period were not decisive, but during the second, they were somewhat favorable to the rice meal. The results for each kind of grain for the entire experiment were as follows:

Rice Meal Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten		Feed per 100 Pounds Gain		Cost of Feed per 100 Pounds Gain
					Meal, Pounds	Milk, Pounds	Meal, Pounds	Milk, Pounds	
Rice meal one part, skim milk four parts	3	314.5	61	1.72	779	3,116	248	991	\$3.84
Corn meal one part, skim milk four parts	3	303	61	1.66	779	3,116	257	1,028	4.63

The corn meal was valued at \$20.00 per ton, rice meal at \$15.00 per ton and skim milk at 20 cents per 100 pounds. This experiment shows that rice meal, such as was used in this test, is fully as valuable as corn meal in pig feeding and corroborates previous work along this line.

Gluten Meal Compared with Corn Meal.—Pigs that had been fed without success on a potato ration at the Cornell Station were given a rational ration of corn meal and skim milk for a week and then they were employed in a test to compare gluten and corn meal. Skim milk was fed, the proportion of meal being about 3 pounds of milk to 1 of meal. Lots 1 and 3 received gluten meal and milk, and lots 2 and 4 corn meal and milk.

Gluten meal was charged at \$11.75 per ton, corn meal at \$14.00 per ton, and skim milk at 15 cents per 100 pounds. The following were the principal results:

Gluten Meal Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Dry Matter Per 100 lbs. Gain, Pounds	Cost Per 100 Pounds Gain	Dressed Weight, Per Cent	Nutritive Ratio
Gluten meal and milk	4	87.25	214	50	1.07	319	\$2.70	77.40	1:2.7
Corn meal and milk	4	90.5	297.5	50	1.49	264	2.50	80.20	1:5.8
Gluten meal and milk	4	47.5	157.5	50	.79	252	2.40	.....	1:2.7
Corn meal and milk	4	48.5	219	50	1.10	151	1.90	.....	1:5.8

The use of gluten meal in combination with skim milk in this experiment did not give results so satisfactory as where corn meal and milk were fed. Both corn meal lots made better gains and the average dry matter consumed and cost per 100 pounds gain, were much lower than with the pigs on gluten meal and milk.

Hominy Meal Compared with Corn Meal.—In Massachusetts the Hatch Station compared hominy meal and corn meal. The latter is described as consisting of the hulls, germs, and some of the starch and gluten of the corn ground together. This separation is said to be brought about solely by the aid of machinery. The hard flint part of the corn is hominy, which is used as a human food.

Seven Chester White grades were fed on a grain and skim milk ration, 7 to 10 quarts of skim milk being fed daily with a grain allowance of 3 to 6 ounces to each quart of milk, depending on appetite and size. One lot received corn meal and milk, and the other hominy meal and milk. The results are shown in the following table:

Hominy Meal Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten		Feed Per 100 lbs. Gain		Dry Matter Per 100 lbs. Gain, Pounds
						Grain, Pounds	Milk, Pounds	Grain, Pounds	Milk, Pounds	
Corn meal	4	56	503	98	1.28	1,022	7,702	203	1,532	321
Hominy meal	3	58	410	98	1.39	766	5,779	187	1,410	306

These figures show hominy meal, as fed in this experiment, to have a feeding value equal to that of corn meal. In this one test corn meal failed to give quite so good results as the hominy meal, showing an average daily gain of 1.28 pounds to 1.39 pounds for hominy meal, and 321 pounds dry matter for 100 pounds gain to 306 pounds dry matter for 100 pounds gain in the case of the hominy meal.

Corn Meal Compared with Cerealine Feed.—Two tests were made at the Hatch Station to compare corn meal with cerealine feed. Like hominy meal, cerealine feed consists also of the hull and a portion of the starch of the corn. It contains rather less of the starch than hominy meal. It is the by product resulting from the preparation of the breakfast food known as cerealine flakes. It is very coarse looking and appears very much like unground corn hulls.

In the first test six grade Chester White pigs, about five weeks old, were used. They were fed 6 to 9 quarts of skim milk per head daily and the grain fed at the start was 3 ounces for each quart of milk; the grain was increased with age and weight. The nutritive ration was 1:3 at the beginning and 1:7 at the close.

In the second test six pigs, a cross between the Poland China and the Chester White, about five weeks old, were fed skim milk in connection with the cerealine feed, which was eaten with seeming relish at all times. The following table shows the results:

Cerealine Feed Compared with Corn Meal for Pigs.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Total Feed Eaten		Feed Per 100 lbs. Gain		Dry Matter Per 100 lbs. Gain, Pounds
						Grain, Pounds	Milk, Pounds	Grain, Pounds	Milk, Pounds	
Corn meal.....	3	48	413	106	1.30	731	4,827	177	1,169	260
Cerealine feed.....	3	45	398	106	1.25	731	4,827	184	1,212	277
Corn meal.....	3	68	315	78	1.34	680	3,061	216	972	281
Cerealine feed.....	3	67	293	78	1.25	676	3,061	231	1,041	305

In these tests cerealine feed showed considerable value as a pig feed, but failed to give as good results, either in rate or economy of gain, as corn meal. Digestion experiments at the Hatch Station with sheep have shown that cerealine feed contains as much digestible matter as corn meal. The station authorities suggest that the coarse nature of cerealine feed lessens its value as a pig feed.

Value of Corn Hearts.—Duggar fed three lots of three pigs each to compare hearts with corn meal and cow pea meal. These feeds constituted half the ration, the other half being rice bran. The following table shows the results:

Value of Corn Hearts.

RATION	Number of Pigs	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed Eaten, Pounds	Feed Per 100 Pounds Gain, Pounds
Corn hearts.....	3	65	35	.62	480	738
Rice bran.....						
Cow pea meal.....	3	81	35	.77	479	595
Rice bran.....						
Corn meal.....	3	98	35	.93	540	550
Rice bran.....						

Analyses at the Alabama Station indicated that the corn hearts used in this experiment contained 8.9 per cent protein and the rice bran 9 per cent protein.

Gluten Meal Compared with Linseed Meal for Balancing Rations.—Patterson, at the Maryland Experiment Station, fed four lots of five high grade Poland China pigs each to compare gluten meal and linseed meal as the nitrogenous components of the ration. Lots 1 and 2 received hominy chops, three-fifths; linseed meal, two-fifths; lots 3 and 4 received hominy chops, three-fifths; king gluten meal, two-fifths. Both lots had skim milk in the proportion of 1 pound of milk to 1 of grain. The results were as follows:

Gluten Meal Compared with Linseed Meal in a Carbonaceous Ration.

RATION	Number of Pigs	Average Weight at Beginning, Pounds	Total Gain, Pounds	Number of Days Fed	Average Daily Gain, Pounds	Feed Per 100 lbs. Gain		Cost Per 100 Pounds Gain
						Grain, Pounds	Milk, Pounds	
Hominy chops, three-fifths; linseed meal, two-fifths	5	37	298	60	.99	242	242	\$2.71
Hominy chops, three-fifths; linseed meal, two-fifths	5	36	294	60	.98	242	242	2.70
Average.....						242	242	\$2.70
Hominy chops, three-fifths; gluten meal, two-fifths	5	36	241	60	.80	233	233	\$2.20
Hominy chops, three-fifths; gluten meal, two-fifths	5	37	256	60	.85	220	220	2.07
Average.....						226	226	\$2.13

This table shows advantages of gluten meal. Both rate and economy of gain favor the corn by product. The cost of gluten meal ration was much less than the one into which linseed meal entered.

**Cotton
Seed Meal.**

No feed of the South has so wide a range of interest as cotton seed meal. It is a concentrated feed of high value for cattle and sheep, and its effects on the fertilizing value of the manure are nearly as great as its effects on the feeding value of the ration.

The influence of cotton seed meal extends far beyond the states where it is produced, and farmers the entire country over have come to depend upon it to balance their rations and enrich their fields.

Danger of Use of Cotton Seed Meal in Pig Feeding.—For some reason, as yet unexplained, this by product is usually fatal to pigs in from three to ten weeks after feeding has commenced, the mortality being at least 50 per cent. In two tests conducted by the Texas Experiment Station, boiled cotton seed gave the least serious results, while soaked raw cotton seed, roasted cotton seed and raw cotton seed meal proved more serious. In one test, ten of a lot of fifteen pigs fed cotton seed or cotton seed meal, died. At the Iowa Experiment Station, of six pigs that were on a ration of cotton seed meal, corn and cob meal and buttermilk, three died. At the Kansas Experiment Station, four young pigs on a ration composed of one-sixth cotton seed meal and five-sixths corn meal, died within forty-six days after feeding commenced. At the Arkansas Station, three lots of three pigs each were fed mixed rations, the cotton seed meal constituting one-third of the grain. All died.

The time intervening between the beginning of feeding cotton seed or cotton seed meal and the first appearance of trouble, varies somewhat. Curtis gave six to eight weeks; Lloyd, in one test, lost the first pig at the end of the fourth week; in another test, deaths began in about forty days; Curtis lost the first pig fifty-one days after feeding commenced. Dinwiddie's first pig died thirty-five days after feeding commenced, and Duggar lost the first pig thirty days after feeding commenced. It therefore appears that there is no very definite period of time that is required for the poison to manifest itself. However, Cottrell states that cotton seed meal may be fed for three to four weeks before danger is imminent, and Curtis and Malone state that no case has come under their experience "where a pig has died if the cotton seed mixture has not been continued longer than three weeks."

Symptoms of Poisoning.—Poisoning is manifested in a peculiar manner. In many cases pigs that are apparently well in the evening are found dead in the morning, and often the most careful watching fails to show any indications of indisposition. Where symptoms are present, those most characteristic seem to be disorder of respiration, which is manifested by quickened breathing, coughing or hiccough. Failing appetite usually calls the attention of the feeder to the approach of danger. Seldom more than two days intervene between the first symptom and death. Francis gives the following symptoms of the trouble with Texas pigs:

"The attack was sudden as a rule; in fact, in the majority of cases an animal was found dead that had been apparently well twelve hours before. In those cases which we were fortunate enough to witness, the symptoms were those of a sudden contraction of the diaphragm, producing a sound similar to hiccough in man. The animal stood with head near the ground, the flanks tucked up, the ears hanging pendulous, and the tail straight and limp. Some would lie flat on the belly, never on the side, while others would assume a sitting up-posture with the fore legs well apart. In several cases there was a marked elevation of temperature, the thermometer registering 160 degrees Fahrenheit per rectum. The circulation seemed very weak and rapid. The gaspings became more and more frequent and violent, and after a few struggles the animal was dead. As a rule they were dead in an hour. In the last moments great quantities of foam or froth would come from the nose or mouth."

The symptoms observed by Dinwiddie are described as follows:

"The disease in all cases was of a type which might be described as acute. In several instances the animals were said to be off their feed for one or two days before other symptoms were observed. Every animal which exhibited any symptoms at all died within twenty-four hours. It would remain by itself, standing, disinclined to move, breathing with extreme rapidity and jerking or thumping in the flanks, and before death frothing at the mouth and nostrils. Fever was absent, or but slight; eyes dull and sometimes bloodshot. Coughing occasionally occurred."

Pathological Features.—Francis states: "On post mortem examination the digestive organs appeared normal throughout. The other abdominal organs appeared normal. The respiratory organs were full of foam. The lungs themselves were bright red and very much congested and doughy."

Mayo pronounced the death of the Kansas pigs to be due in all cases to "congestion and inflammation of the intestines, lungs and heart," but Niles could find no assignable cause of death in the case of the Iowa pigs.

Dinwiddie, in the Arkansas experiments, made post mortem examinations of eight of the nine pigs which died, and found a very constant condition of disorder. He says, in describing the first examination, the description of which applies to all cases:

"The body presented no external changes. Subcutaneous tissue showed blood extravasations in streaks and points. Blood engorgement of lymph nodes of neck and jaws. Respiratory and buccal mucous membrane, dusky red. Pleural cavities contain a large quantity of yellow, cloudy fluid, compressing the lungs to less than half their normal bulk. In the pericardial sac there is a similar dropsical effusion, part of which has formed into a soft, yellowish white clot. No evident pleuritis. Lung, dark red, congested and collapsed. Cavities of heart contain dark, soft blood clots; slight petechial extravasations on the epicardium. No obvious peritoneal effusion. Liver is dark in color, friable and deeply blood engorged, the lobular boundaries on section being unusually prominent, with dark red depressed centers. Kidneys on section appear congested throughout, capsule non-adherent.

"The stomach and intestines often showed abnormal features. The small intestines ((jejunum) frequently showed hyperemic patches on both the serous and mucous surfaces, and the large intestine and stomach in several cases contained a considerable quantity of gravel. The urine was slightly albuminous in two cases. In one instance, where the brain was dissected, there was engorgement of the veins and sinuses of the dura mater, which extended backward into the vessels of the neck. The histological examination is described as follows:

"Sections of the liver tissue reveal an intense congestion of the portal system, the intralobular capillaries especially being enormously engorged throughout and the liver cells compressed and shrunken. There is, however, no marked degeneration, and the nuclei take the stain in the normal manner. Sections of the kidney exhibit a similar capillary engorgement, though less intense. The glomerular tufts are compressed by edematous effusion into their capsules. A degenerated process in the cells of the urinary tubules or other marked pathologic changes were not demonstrated. In the spleen no distinct pathologic changes are found. The lung sections show a marked congestion of capillary vessels, with edematous effusions and occasional blood extravasations, but without cellular proliferation or infiltration. There is no evidence of pneumonia or pleurisy."

Treatment.—As a rule, hogs suffering from the effects of cotton seed poisoning, if taken from the cotton seed ration and placed on rich, green pasture, become apparently well in a week. A similar result follows when they are simply deprived of the cotton seed meal of the ration and given an ordinary grain ration. However, Curtis reports a case where a pig died during the winter after a week's feeding on a straight corn diet that followed four weeks' feeding on a ration of one-fifth cotton seed meal and four-fifths corn meal; and Dinwiddie and Duggar had similar experiences. In some cases pigs may pass through a season of cotton seed meal feeding and thereafter be indifferent to it. Curtis found that if a pig lived thirty days after the first appearance of trouble it could be regarded as immune from the effects of cotton seed but the experience of others seem to contradict this. Dinwiddie gives two months as the time required for a hog to be on cotton seed meal before it can be regarded as immune.

The Cause of Poisoning not Known.—The poisonous agent in cotton seed has not yet been determined. So far chemical and bacteriological examinations have revealed nothing to which can be attributed its dangerous character. The injurious action has been variously attributed to the lint on the seed, the large fat content, the highly nitrogenous composition, the sharpness of the hulls, the presence of a toxin, supposititious chemical or bacteriological changes in the meal, formation of poisonous crystals by metabolism, etc. Up to a certain period the amount of cotton seed or cotton seed meal fed does not seem to have any influence on the health of the pigs, but the evidence on the subject is so meager that one is not justified in drawing conclusions as to the amount of meal that can be fed safely. Curtis inclined to the toxin theory; he found the amount which proved fatal in his investigation to be from 23 to 33 pounds of cotton seed meal. Dinwiddie holds to the belief that there is a toxic principle in the

seeds of the cotton plant is the most reasonable one, and one that has not been disproved. The action seems to be more virulent with young than with older animals, which is characteristic of poisons. He points out that the amount fed to pigs is much larger in proportion to their body weight than that fed to cattle and suggests this as a reason for the supposed greater immunity of cattle. With a 1,000 pound steer, 4 pounds of cotton seed meal is an amount equal to 0.4 per cent of the body weight. In the case of the pigs in the Arkansas experiments, the proportion was about 1.5 per cent of the body weight at the beginning of feeding. The amount of cotton seed meal eaten per head was 23, 25, and 45 pounds, respectively, in the three experiments at that station. Dinwiddie calls attention to the fact that other animals are susceptible to cotton seed poisoning and states that guinea pigs, to which he fed small quantities of cotton seed meal along with bran, died in from two to three weeks. He also admits the possibility of ptomaine poisoning.

At the Alabama Station, two of Duggar's experiments resulted fatally. In the first experiment the smaller pigs were the first to die. They averaged about 64 pounds, and 12.20 pounds of cotton seed meal were eaten by each before death ensued. This was 0.25 pound daily per head, or 0.4 pound daily per 100 pounds live weight for forty days and a total of 18.90 pounds per 100 pounds average live weight. Larger pigs in this experiment, averaging a little over 70 pounds, died when 16.60 pounds of cotton seed meal had been fed per head. These pigs were fed 0.41 pound per head daily, or 0.50 pound per 100 pounds live weight daily for forty-three days; the total amount of cotton seed meal fed was 21.60 per cent of the average live weight. In the second fatal experiment one of the pigs died after having appeared gaunt and weak for two days. This pig averaged about 60 pounds in weight and up to the time of death had been fed 5.4 pounds of cotton seed meal. This was a total of 9.2 pounds per 100 pounds live weight. The pig had not had more than 0.25 pound cotton seed meal daily per 100 pounds live weight. The other pigs in the same lot showed an unthrifty condition and the ration was changed (in one of the Kansas Experiment Station tests a similar small amount of cotton seed meal produced fatal results). The ration in both experiments was cotton seed meal one-fifth, corn meal four-fifths.

In another test with a ration of corn meal three-fourths, cotton seed meal one-fourth, the pigs were noticed to be out of condition toward the thirty-fifth day, but no deaths occurred. They averaged about 118 pounds in weight, and the amount of cotton seed meal which made them sick was 25.5 pounds. This was 21.4 pounds per 100 pounds live weight, or 0.61 pound daily per 100 pounds live weight.

The causes of death are regarded by Dinwiddie as being both essential and contributory, the essential cause being the toxic principle supposed to be present. He describes the immediate cause of death as follows:

"In all our cases the immediate cause of death was obviously asphyxia, due to pressure on the lungs by dropsical effusion into the pleural cavities. In its final manifestations the disease was an acute dropsy of the pleural and pericardial sacs. The congestion of the abdominal organs, and especially of the portal system, can be attributed to obstructed circulation through the collapsed lungs, damming the blood back in the venous system, and hence a process secondary to the pleuritic effusion. That this portal engorgement was secondary to the pleural effusion, is inferred from the absence of degenerative or other changes in the liver, which would account for it, and from absence of any marked peritoneal effusion. Ascites would be the first result of such extreme portal congestion if it were primary. All of these conditions, however, are necessarily the result of some fundamental cause, the nature of which is yet to be discovered. An acute hydrothorax and hydrops pericardii, unaccompanied by ascites and without any antecedent pleuritis, is a condition rarely met with in human pathology. Non-inflammatory dropsical effusion may be due to mechanical obstruction, cardiac disease, degenerative changes in the kidney or liver, or to physical or chemical changes in the blood itself. Neither of the first three causes appear to be in operation here. Further researches will probably show some grave alteration in the composition of the blood, as the primary effect of acute cotton seed meal poisoning. In hogs, at least, nervous derangements are not manifested, so far as have been seen."

Points that may in time lead to the discovery of the trouble are that old meal seems to be more fatal than fresh, that cotton seed meal is more fatal than cotton seed in any condition, and that the poisonous agent is not in the oil, but seems to be entirely left in the cake when the oil is pressed out. It

is also well known throughout the South that decomposed cotton seed has little, if any, dangerous character, and it has been pretty clearly established by the studies of Curtis and by the experience of practical feeders that the meal is so changed by the processes of digestion that hogs following steers which are being fed a heavy cotton seed meal ration are not injured by the droppings.

Feeding Value.—Disregarding, for the moment, the fatal effects of this product, let us consider its feeding value. The results from feeding either the whole grain or the meal have not been uniform, and have given rise to three opinions regarding its value as a pig feed—(1) that it is both worthless and dangerous; (2) that it is only fairly valuable and hardly worth the risk of feeding, and (3) that it is extremely valuable if means can be devised to feed it without fatal results.

The Kentucky Experiment Station fed a ration of one part cotton seed meal, one part wheat bran, two parts corn and cob meal for twenty-eight days, when ship stuff replaced the cotton seed meal, because the pigs refused it, whether fed wet or dry. No fatalities were reported, but the gains were unsatisfactory, and the station came to the conclusion that in Kentucky cotton seed meal could not be profitably fed to hogs, whether for growth or fat.

Curtis expresses himself in a similar tone, that after two years' successive tests in feeding cotton seed and cotton seed meal to hogs, with a definite aim in view, and after practical attempts to use these products in a similar manner for the past ten years, we do not hesitate to express our candid opinion that there is no profit whatever in feeding cotton seed in any form or cotton seed meal to hogs of any age; that it is practically impossible to prepare cotton seed or cotton seed meal in any manner so that hogs will eat it greedily.

Lloyd's opinion, from his experience at the Mississippi Station, is somewhat similar. He had losses from raw cotton seed meal, but none from those getting cooked seed, although these pigs became very sick and refused to eat. His gains were neither satisfactory nor profitable. With one bunch of pigs the average daily gain was but 1 pound for the first two weeks, after which the gains were small, although the pigs did not lose their appetite and continued to eat with relish. The after effects of feeding in this case were detrimental, as the pigs never got into good condition.

At the North Carolina Station, Emery fed an 88-pound pig for sixty-one consecutive days on a cotton seed meal ration, the amount of cotton seed meal varying from $\frac{1}{4}$ pound daily at the beginning to 2 pounds daily at the close. Skim milk was fed during the first three weeks, and green feed during the first six weeks. Two pounds of cotton seed meal daily made the pig sick, and for twenty-two days the meal was dropped from the ration. Then the feed was made one-fourth cotton seed meal, three-fourths wheat bran, with 12 pounds of skim milk daily for ten days, after which corn meal was substituted for the cotton seed meal. The feeding was unprofitable, but the pig did not die.

Among the instances where feeding was fairly profitable, the results at the New York (State) Station may be noted. The intention was not to note the effects of cotton seed meal feeding. Cotton seed meal in amounts varying from one-thirteenth to three-tenths of the entire ration was fed with good results, covering periods of from fifty-six to one hundred and thirty-nine days. Two pigs in a lot fed on wet feed were troubled with indigestion, and after the close of the trial one of them died from congestion of the liver, following indigestion. This may have been cotton seed meal poisoning. The pigs were on a ration in which there was 3-10 pound daily for sixty-three days.

Cary's results in Alabama are remarkable because of the large quantities of cotton seed fed. He conducted three experiments in which cotton seed or cotton seed meal were fed to thirteen pigs from $1\frac{1}{2}$ to $4\frac{1}{2}$ pounds of crushed cotton seed were fed per head daily. In two instances cotton seed meal was fed, but in small amounts (3-10 pound daily in each case). The pigs receiving cotton seed meal did not thrive, losing appetite; one of them received bran, the other corn meal in addition to the cotton seed meal, and both had green feed. When they were taken from the cotton seed meal and placed on corn and pasture they recovered rapidly.

In the first test, the pigs on crushed cotton seed made fairly good gains. They had some grain in addition, and all received green or succulent feed. In the second test three pigs were fed rations of corn meal and crushed cotton seed or ground cow peas and crushed cotton seed. The rations were heavy, 6 pounds when corn meal was fed and $6\frac{1}{2}$ pounds when cow peas were fed; the amount of cotton seed

was more than half the ration. Fair gains were made and the after effect does not seem to have been serious as the pigs did well when placed on pasture and corn. One pig in this lot had crushed cotton seed alone, being fed $4\frac{1}{2}$ pounds daily. He lost in weight but gained in size of frame. When turned on pasture and given corn he did well. Another pig that had $3\frac{1}{2}$ pounds of crushed cotton seed and $3\frac{1}{2}$ pounds green rye daily, lost 28 pounds in twenty-eight days. After the rye was discontinued the pig failed to thrive, but recuperated rapidly on pasture with corn.

In three cases where 3 pounds of crushed cotton seed were fed daily, with ground cow peas and green rye, or corn meal and green rye, nominal gains were made. No disastrous effects followed when green feed was discontinued; subsequent treatment on pasture and corn gave good gains.

In a third test two pigs were fed for forty-nine days on a daily ration of 6 pounds of separator milk and $3\frac{1}{2}$ pounds of crushed cotton seed, then for fifty days on 6 pounds of whole milk and $3\frac{1}{2}$ pounds crushed cotton seed. Their appetites failed twice, but they gained slightly in weight.

Length of time that cotton seed or cotton seed meal was fed in these experiments was one hundred and five days in the first, ninety-one days in the second, and one hundred and nine days in the third. Although the pigs were occasionally off their feed, there were no fatalities.

Duggar's experiments did not show very favorable results for cotton seed meal as part of the pigs' ration. In no case did the pigs so fed make so great an average daily gain as 1 pound, and the gains were usually expensive, whether the grain was fed alone or with green feed. Rations of corn meal only gave better results. One lot of two pigs, averaging 68 pounds, fed a ration of cotton seed meal one-fifth, corn meal four-fifths, and grazed on sorghum made an average daily gain of 0.53 pound for thirty-four days, at an outlay of 380 pounds of grain for 100 pounds gain. Another, averaging 68 pounds, on the same grain ration, but grazing peanuts, made an average daily gain for thirty-eight days of 0.94 pound, requiring 185 pounds grain for 100 pounds gain. Another lot made an average daily gain of 0.8 pound for twenty-eight days on a ration of cotton seed meal one-fourth and corn meal three-fourths, requiring 384 pounds grain for 100 pounds gain, while a lot on corn meal only in the same test, made an average daily gain of 1.1 pounds, but required 531 pounds grain for 100 pounds gain. Duggar found corn meal only a more palatable ration than one to which cotton seed meal had been added, and had difficulty in inducing pigs to eat a full allowance of a cotton seed meal ration.

The Kentucky, Wisconsin, Iowa, Kansas, and Oklahoma Experiment Stations have published results that show cotton seed meal to have considerable feeding value for pigs.

In Kentucky, May fed cotton seed meal at intervals of one week as part of the ration to twenty grade Berkshire pigs during a three weeks' finishing period with very good results.

At the Wisconsin Station, Henry fed two lots of five pigs each for thirty-five days on a ration of which $\frac{1}{2}$ pound daily was cotton seed meal. The feeding was alternated, one lot receiving oil meal while the other had cotton seed meal. The result of the grain ration was a mixture of equal parts of wheat shorts and corn meal. Skim milk and whey were fed and the feeding was done in the fall and winter. The pigs were never sick nor off their feed and made their gains economically. The tabulation of results shows that while on cotton seed meal the pigs required 5 per cent less feed than while on oil meal.

At the Iowa Experiment Station, Curtis fed two lots of three Poland China pigs each on a ration of corn and cob meal, cotton seed meal and buttermilk. One lot received $\frac{1}{2}$ pound of cotton seed meal per head daily and the other 1 pound per head daily. The grain fed was soaked for twelve hours before feeding. Salt and ashes were also given. Everything went well until the sixth week, when the droppings of the pigs on the heavy ration became dark in color and somewhat hard. However, the appetite was not affected. The first pig died fifty-one days after feeding commenced, and a second went the following day. They had been on the heavy ration, but showed no signs of sickness and their gains had been steady. Sixty-three days after the start a pig in the lot receiving $\frac{1}{2}$ pound of cotton seed meal per head daily, died, but not without symptoms of trouble. For a day or two before death he had shown a failing appetite and quickened breathing. The rest of the pigs in this lot showed the same symptoms, but survived, although their gains were light. The station veterinarian could find no assignable cause of death.

In this experiment the fatal quality of cotton seed meal seemed to depend, to a certain extent, on the quantity fed. The first pigs to die were those in the lots receiving the heavier ration of cotton seed meal. These pigs also made the better gain.

The Kansas Station fed four small pigs on a ration of one-sixth cotton seed meal and five-sixths corn meal. The meal was stirred in water at feeding time. It was not relished at first, but when it was once eaten, rapid gains were made. The first pig died twenty-three days after the feeding began, and could not have eaten more than five pounds of cotton seed meal altogether, a fact which seems to lessen the weight of the theory that the quantity eaten has an influence on the fatal property of the feed. This pig weighed about 18 pounds at the time of its death. The last pig died on the forty-sixth day of the experiment.

Two sows weighing respectively 135 and 308 pounds were put on a ration of one-fourth cotton seed meal and three-fourths corn meal for forty-five days; they gained 89 pounds each without signs of poisoning.

In a second test, six pigs that had been stunted by exclusive corn meal or ground wheat feeding were divided into two lots of three each and put on rations composed of one-fourth cotton seed meal and three-fourths corn meal for one lot, and equal parts of these meals for the other lot. The change of condition is described as magical and immediate. The pigs began to gain in weight at once, and those receiving the greater amount of cotton seed meal made the larger gains. No other food was given. The first pig died on the forty-fifth day of the experiment, the second on the forty-sixth day, the third on the fifty-third day and the fourth on the fifty-sixth day from the beginning of the cotton seed meal feeding. Two pigs were left in each lot; they were placed on green oats and then thrived nicely.

A bulletin from the Kansas Station mentions a lot of pigs that had done poorly in another experiment; they were fed cotton seed meal and were ready for market, well finished, in twenty-two days. At the Kansas Station cotton seed meal is very highly regarded to put pigs in high condition, if fed for a short time in small quantities. The beginning ration is $\frac{1}{4}$ pound cotton seed meal to each 1,000 pounds live weight per day, which is increased in ten days to make the amount 3 pounds per 1,000 pounds live weight. The meal is mixed with the rest of the grain.

The Kansas and Iowa results show that a cotton seed meal ration is valuable if the cotton seed meal is used in moderate amount and for a limited time. The proportions of cotton seed meal used in the Iowa test was about one-eighteenth and one-tenth of the total grain ration at the start, and about one-tenth and one-fifth at the close. Up to the time the pigs began to die, the gains of those on the heavier cotton seed meal rations were the larger and more economical (1.4 pounds daily gain and 343 pounds meal and 250 pounds milk per 100 pounds gain). The lighter ration was about equal in results to one of corn and cob meal, gluten meal and buttermilk, that stood steady to the heavy cotton seed ration. The two lots returned in pounds of gain per 100 pounds of dry matter in the feed (before deaths began) 31.1 pounds and 26.4 pounds, respectively, for the pigs on the heavy and light rations. In the Kansas tests the gains before deaths commenced were also very economical; they varied in cost from considerably less than 300 pounds grain per 100 pounds gain in the case of the pigs that had been previously on the single grain rations to 350 pounds grain per 100 pounds gain in the case of the sows.

Pigs Following Steers on Cotton Seed Meal.—Evidence of the dangerous properties of cotton seed meal for pigs when they are following steers, whose ration is made up wholly or in part of cotton seed meal, is conflicting. In the Iowa tests a lot of three pigs followed steers for seventeen weeks that were receiving from 4 to 7 pounds of cotton seed meal daily. They had very little feed except what they picked up behind the steers, yet there were no noticeable injurious effects.

The Kansas Station states that the meal used in their early experiments was shipped in from Texas during the previous winter by a local feeder, to be fed to steers. He turned about forty hogs after them and all died in the course of six or seven weeks. Considerable evidence that pigs may not suffer after steers that are fed on cotton seed meal has recently been presented in the columns of the agricultural press.

Oklahoma Experiments.

The Oklahoma Station has made an extensive study of the possibility of feeding this by product so that good results may be obtained with little or no danger from poisoning. The conditions under which it has been found that cotton seed meal may generally be fed safely are (1) where pigs have access to range, and plenty of green pasture, and (2) where periods of cotton seed meal feeding of three to four weeks' duration without pasture are alternated with a period on pasture or on a ration from which cotton seed meal has been omitted.

Following up this system the Oklahoma Station has conducted three experiments. In the first trial, in 1900, the alternating method was tried with seventeen thrifty shoats of various sizes. They were put on a ration composed of one-fifth cotton seed meal and four-fifths Kaffir corn meal and had the run of a large paddock where they got a little green stuff. The trial began March 22nd. For twenty-seven days the cotton seed meal ration was fed; then for fourteen days Kaffir corn meal alone; next fourteen days on one-fifth cotton seed meal and four-fifths Kaffir corn meal, then seven days without the cotton seed meal, closing with five days on the original ration. None of the pigs had died, and all made very fair gains on a moderate amount of grain. At the close of this trial part of the pigs were sold and the rest continued on the cotton seed meal ration, with which the trial closed (one-fifth cotton seed meal and four-fifths Kaffir corn meal). They were fed on this ration without change until July 14th with the loss of one pig only.

In the second trial of the same year sixteen stunted shoats, about a year old, averaging 79 pounds, were used. For twenty-six days from April 12th they were hurdled on wheat and fed a light ration of one-fifth cotton seed meal and four-fifths Kaffir corn meal. There was no ill effect from the grain ration. The gains averaged 0.96 pound per head daily, and were made economically. On May 8th the pigs were taken from the wheat and fed the same grain ration in a lot for twenty-one days with no serious results, making an average daily gain of 1.71 pounds at the expense of 307 pounds of grain for 100 pounds gain. Five of the largest were sold after forty-seven days continuous feeding with cotton seed meal ration.

The eleven pigs remaining were then given range and green feed and the same grain ration continued. The gains made were satisfactory. There were no losses and they were sold on July 14th, after ninety-three days continuous feeding on a cotton seed meal ration.

In 1901, sixteen uniform Poland China shoats, farrowed late in the previous fall, were used. They were about eleven weeks old at the beginning of the experiment and averaged 47 pounds in weight. The experiment began January 11th. The pigs were divided into four lots of four each. Each lot was given an open pen, 9x24 feet, and had a space 8x8 feet in an inclosed piggery. Cob charcoal, wood ashes, and salt were always accessible; water only was given to drink, and the grain was mixed with water in the form of a thick slop just before feeding. From April 1st to July 14th, 2 pounds of sugar beets were allowed each pig daily. The pigs were fed as follows: Lot 1 received corn meal only to April 5th, then a mixture of one-fifth cotton seed meal and four-fifths corn meal for four weeks, closing with two weeks on corn meal; lot 2 received one-third corn meal and two-thirds wheat middlings; lot 3 received one-fifth cotton seed meal and four-fifths corn meal; lot 4 received one-fifth cotton seed meal and four-fifths corn meal for four weeks, then corn meal for two weeks, next the cotton seed meal mixture for four weeks, then back to corn meal only for two weeks, and alternating in this manner until the experiment closed.

The only signs of the lack of appetite were in lot 1, where exclusive corn meal feeding proved rather severe for such young pigs, and in lot 3, where a dullness of appetite was noticed for about two weeks. This was only temporary. One pig in lot 4 died on February 15th, one week after it had been taken from the cotton seed meal ration and placed on corn meal, and two pigs in lot 3 died on February 20th, after they had been on a cotton seed meal ration continuously for forty days. No further losses occurred and the pigs thrived and made good gains. One pig in lot 4 showed symptoms of sickness, but recovered.

After April 5th, lot 1 was given the same management and feed as lot 4, but there were no injurious results. On the contrary, their gains increased. This was also noticed with lot 4. During the periods that the hogs were on a straight corn meal ration except during the closing period, when their

greater maturity enabled them to make use of a more carbonaceous ration, the gains were light and expensive, but when the cotton seed mixture was resumed, the gains were large and economical, disregarding the effect of loss by death.

The following table shows the results of 126 days feeding for the pigs that survived:

Feeding Pigs on Cotton Seed Meal Rations.

RATIONS	Number of Pigs	Average Weight at Beginning, Jan. 11th, Pounds	Average Weight at Close, May 17th, Pounds	Average Gain, Pounds	Average Daily Gain, Pounds	Average Amount Grain Eaten, Pounds	Grain per 100 pounds Gain, Pounds	Cost of Grain per 100 pounds Gain
Lot 1. Corn meal	4	46	125	78	.62	368	470	\$2.61
Lot 2. Corn meal, one-third; wheat middlings, two-thirds.....	4	46	191	146	1.15	539	370	2.87
Lot 3. Cotton seed meal, one-fifth; corn meal, four-fifths.....	2	47	182	135	1.07	483	357	2.24
Lot 4. Alternate rations	3	44	178	134	1.06	493	368	2.14

Curtis and Malone suggest that had the cotton seed meal lots been running on green pasture from the beginning of the experiment, no losses would have occurred. They also suggest the probability that a ration of one-tenth to one-fifth cotton seed meal may be fed for an indefinite time if pigs have the run of green pastures.

The Arkansas Experiments.

In addition to throwing light on the pathological features of cotton seed poisoning, Dinwiddie has corroborated the results of those stations which have shown that, when properly fed, cotton seed meal is a valuable pig feed if losses can be avoided. In the experiments in which all the pigs died, lot 1 received a ration of cotton seed meal one part and corn chops three parts; lot 2 received cotton seed meal one part and corn meal three parts, with roots; lot 3 received cotton seed meal one part and wheat bran three parts, and lot 4 received bran one part and corn chops three parts. There were three pigs in each pen and feeding began January 1, 1902. The pigs were confined in pens with an open shed for shelter, were watered and fed twice daily and had a mixture of hardwood ashes and salt supplied constantly. The results are tabulated as follows:

Feeding Pigs on Cotton Seed Meal Rations.

RATIONS	Number of Days Until First Death	Eaten Per Head, Pounds	Eaten Daily Per Head, Pounds	Eaten Daily to Initial Weight, Per Cent	Initial Weight, Pounds	Daily Gain Per Head, Pounds	Daily Gain to Initial Weight, Per Cent
Lot 1.	35	23	.68	1.6	41	.9	2.2
Lot 2.	40	23	.63	1.5	42	1.	2.4
Lot 3.	61	45	.80	1.6	48	1.	2.1
Lot 4. .....	..	..	....	....	47	.9	1.9

Dinwiddie points out particularly that a corn meal and cotton seed ration, which one would naturally select as giving the proper proportions between nitrogenous and carbohydrate constituents, proved the most fatal in his experiments, and that the bran and cotton seed meal ration, the most nitrogenous of the three, required the most time for the dangerous property to assert itself. Contrary to what one would expect from the Oklahoma result, roots did not have so good an effect as the wheat bran.

The pigs received from 0.64 to 0.8 pound of cotton seed per head, daily, which was from 1.5 to 1.6 per cent of their initial body weight. The first death occurred in the case of the pigs on corn and cotton

seed meal thirty-five days after the feeding commenced, an average of 23 pounds of cotton seed meal being eaten per head. In the case of the pigs fed corn, cotton seed meal and roots, the first death was forty days after the beginning, an average per head of 25 pounds of cotton seed meal being eaten. The first death in the case of the pigs on bran and cotton seed meal occurred sixty-one days after the beginning, 45 pounds of cotton seed meal being eaten per head. Up to the time of death the gains of the pigs on cotton seed meal were as good or better than those of the pigs on corn chops and bran (lot 4).

Following the experiments in which all the pigs on cotton seed meal died, Dinwiddie fed four native pigs, averaging about fifty pounds in weight, on various rations, cotton seed meal being a prominent factor, constituting one-fourth of the ration. Turnips were fed for eighty days, after which rye, oats and alfalfa were given for two months. The pigs were fed from February 26 to November 6, 1902. Only one received cotton seed meal throughout the experiment, and for a small part of the time none was given to it. The other pigs received rations of equal parts of bran and corn meal or ear corn, after being taken from the cotton seed meal ration.

Dinwiddie presents the following tabulation of the results of this experiment:

Feeding Pigs on Cotton Seed Meal Rations.

DESIGNATION OF PIG	Number of Days Fed Cotton Seed Meal	Weight of Cotton Seed Meal Eaten, Pounds	Weight of Cotton Seed Meal Eaten Daily in First Period (80 days), Pounds	Daily Consumption of Cotton Seed Meal to Initial Weight, Per Cent	Weight of Cotton Seed Meal Eaten Daily in Second Period (59 days), Pounds	Weight of Cotton Seed Meal Eaten Daily for Remainder of Test, Pounds
A	139	80	.58	1.4	a .55	
B	248	242	.58	1.4	.55	b 1.5
C	198	137	.58	1.4	.55	c 1.
D	198	137	.58	1.4	.55	c 1.

a Decrease probably due to a larger supply of green feed.

b One hundred days. (Cotton seed meal 1, corn meal 3.)

c Fifty-nine days.

A third test was made in which rations of cotton seed meal one part and bran three parts, and cotton seed meal one part and wheat chops three parts were fed. The former ration was fed for ninety-five days to six pigs, which averaged about 50 pounds in weight. The latter was given for ninety-nine days to four Tamworth pigs, averaging about 50 pounds in weight. The following table shows the results:

Feeding Pigs on Cotton Seed Meal Rations.

RATIONS	Number of Pigs	Time Fed Cotton Seed Meal, Days	Average Amount Cotton Seed Meal Eaten, Pounds	Average Amount Cotton Seed Meal Eaten During First Month, Pounds	Cotton Seed Meal to Estimated Initial Body Weight, Per Cent	Average Amount Cotton Seed Meal Eaten Daily After First Month, Pounds	Cotton Seed Meal Eaten Daily During Test, Pounds
Cotton seed meal one; bran three	6	95	54	.4	.8	.6	.5
Cotton seed meal one; wheat chops three	4	99	57	a .4	18	b .7	.5

a First half of period.

b Last half of period.

There were no losses from these rations and the pigs made small gains.

Effect of Cotton Seed Meal on Pregnant Sows.—Dinwiddie fed a native sow carrying her third litter on a ration of cotton seed meal one part and bran three parts, for eighty days before farrowing. She ate a total amount of 112 pounds of cotton seed meal, which was 1.39 pounds daily, or 0.8 per cent of the estimated initial body weight. The ration agreed with her, and there appeared to be no harmful effects on the fetal litter, it being farrowed safely, with no still births.

Effect of Crude Cotton Oil.—Dinwiddie fed three pigs on a ration of corn meal one part, wheat bran two parts and crude cotton oil 0.1 to 0.4 part. The amount of cotton oil fed (estimating the fat content of cotton seed meal at 14 per cent) was equivalent to that contained in from 0.25 to 1.8 pounds

of cotton seed meal, the smaller amount having proved fatal in the Arkansas results, already discussed. These pigs were on the cotton oil ration 144 days. The amount of oil fed for the entire time to each pig was 21 pounds, equivalent to 150 pounds of cotton seed meal. The average daily amount of oil consumed varied from 0.06 pound (meal equivalent, 0.4 pound) to 0.24 pound (meal equivalent 1.6 pounds). The average daily amount of oil fed for the entire test was 0.14 pound (meal equivalent 1 pound). The pigs made an average daily gain of 0.6 pound, and suffered no serious effects from the oil.

Use of Cotton Seed Meal in the Feed Lot.—The use of cotton seed meal in the feed lot must be very carefully guarded, especially until the conditions under which it may be used without danger and the circumstances which govern the demonstration of its poisonous properties are more thoroughly understood. The feeding of the cotton seed meal which the South produces is one of the greatest problems of agriculture in that section yet to be solved satisfactorily. It is not difficult to appreciate what may be gained if some of this by product, which has such high feeding and fertilizing value, and which is exported in such enormous quantities, can be converted into pork products, which are now largely imported from other states.

Packing House By Products.

The frugality of the modern meat packer has become almost proverbial. Less than twenty years ago the disposal of the offal of slaughtering was a problem, but at present there is very little waste, and the packer has actually come to regard the by products as the principal source of profit in his business. The preparation of these by products for use as animal feed is one of the largest developments of this branch of industry. Fertilizers have long been prominent in the sales, the material that enters into their composition being meat scraps, blood, bone, hair, intestinal contents, etc. The use of tankage, a by product that has had its sale entirely as a fertilizer, is growing among pig feeders and has been studied by Plumb and Van Norman, at the Indiana Station, and by Kennedy and Marshall, at the Iowa Station. Beef meal is also a packing house by product whose feeding value was studied along with that of tankage in the Iowa experiment.

Character of Packing House By Products.—Plumb and Van Norman state that tankage may contain meat scraps, intestines and their contents, hair, etc. It is classed as concentrated and crushed tankage. Concentrated tankage is not used for animal food. Crushed tankage is said to be of several grades, being graded according to the ammonia and phosphoric acid content, although it is probable that the tankage graded as No. 1 is free from the contents of the intestines.

Kennedy and Marshall used two brands of tankage, made by Chicago packers. One of these is described as follows:

Digester tankage is made from meat scraps, fat trimmings, and scrap bones. These are taken up as fast as taken from the animals and put into a large steel tank and cooked under live steam pressure of 40 pounds to the square inch, which cooks out the tallow. After the steam is turned off, it is allowed to settle, when the grease rises to the top and is drawn off. After the grease is drawn off the tankage is kept agitated, and by evaporation the water is extracted until the tankage contains about 8 per cent moisture. It is then taken out of the tank, allowed to cool, is ground, and stored ready for shipment. The tankage is supposed to contain about 60 per cent protein and 10 per cent fat.

The Manufacture of the Other Tankage is Thus Described:—This by product, like the one just described, is made from meat scraps, scrap bones, etc. Quoting the words of the manufacturer, it is as follows: "Tankage is the by product which drops to the bottom in our rendering tanks when we are rendering outgrease, tallow, etc., at our various packing houses. It has been thoroughly cooked under 40 pounds pressure for several hours, which thoroughly destroys any disease germs which might possibly be in the raw meat. This product is pressed and then dried in steam driers at a high temperature. It is then ground and shipped in 100 and 200 pound sacks."

The Beef Meal, Used in the Iowa Test, is Described as Follows:—This by product is made from scraps of meat and bone from which the grease has been extracted, and the liquors concentrated by cooking. These are then pressed, dried and ground, in preparation for the market. It is claimed to contain from 40 to 50 per cent protein.

Analyses of Packing House By Products.—The analysis reported by the Indiana Station is as follows:

Moisture	Per Cent	8.63
Protein		49.81
Ether extract		15.78
Crude fiber		4.78
Nitrogen free extract		5.06
Ash		15.94

100

The Iowa Station analysis, including that of corn meal used, is as follows:

Analysis of Feedstuffs (Weems).

RATION	Water, Per Cent	Ash, Per Cent	Protein, Per Cent	Crude Fiber, Per Cent	Nitrogen Free Extract, Per Cent	Ether Extract, Per Cent
Corn meal	11.05	1.55	15.25	4.85	63.80	3.50
Beef meal	6.10	15.60	61.10	5.20	3.12	8.88
Tankage	6.25	12.85	42.15	6.95	15.50	16.30
Tankage	9.05	20.65	39.10	10.90	8.60	11.70

Feeding Tankage in a Corn Meal Ration.—In the Indiana experiment sixteen young pigs were fed to determine the value of tankage. The pigs were pure bred Poland Chinas and Berkshires. There were four lots, two of each breed in each lot. The tankage was especially prepared by the packers who furnished it to the experiment station, and was made from bones and meat taken from the cutting room, tanked immediately, and pressed and dried.

The conditions of the experiment were equal for all lots; all had an opportunity for getting exercise and each lot was in a separate enclosure. There was no sickness and lot 3 was the only one showing lack of appetite at any time. The pigs were fed as follows: Lot 1, ten parts corn meal and one part tankage; lot 2, five parts corn meal and one part tankage; lot 3, corn meal; lot 4, ten parts of a mixture of equal parts of corn meal and shorts and one part tankage. The feed was weighed out and then mixed with tepid water in the proportion of about two parts of water to one part of feed, a slop of medium thinness being made. Each lot of pigs had access to ashes and salt. The cost of feed used was as follows: Corn meal, \$20.00 per ton; shorts, \$16.00 per ton; tankage, \$30.00 per ton.

The Iowa test with beef meal seems to show that it, like tankage, is valuable in a pig's ration. The corn meal fed lot made an average daily gain of 2.08 pounds, requiring 461 pounds of food for 100 pounds gain, and making gains at a cost of \$5.10 per 100 pounds. Those fed beef meal made an average daily gain of 2.40 pounds, requiring 346 pounds grain and 65 pounds beef meal for 100 pounds gain, at a cost of \$4.80 per 100 pounds gain. Sixty-five pounds of tankage thus saved 115 pounds of grain, nearly 25 per cent—surely an eloquent argument that animals need more than the mere grain they usually obtain. Davis Digester Tankage is standard. Insist upon it.

Dairy By Products.

The use of the by products of the dairy and creamery (skim milk, buttermilk, and whey) is one of the most interesting subjects of study in pork production. The value of milk is known on every farm, although it may not be fully appreciated, and anyone who has fed pigs knows the keen appetite these animals have for milk and its by products. In the neighborhood of many large dairies pork production has become a very prominent and lucrative branch of the dairy industry.

Regarding solely their chemical composition, the by products of the dairy contain most of the indispensable feeding constituents of the milk from which they are produced.

The residue from the separation of cream (skim milk) and that from churning (buttermilk) leave two by products that contain practically all the protein and carbohydrates of the whole milk. In cheese making, the whey that is left is the least valuable of the dairy by products, the greater part of the casein

and fat of the milk being retained in the cheese. While whey is by no means worthless for feeding purposes, it can readily be seen that if skim milk and buttermilk have higher feeding values for pigs than whey, butter making and pig feeding will more profitably accompany each other than will cheese making and pig feeding. These by products supply growing material to young animals and provide an excellent nitrogenous balance in the fattening ration. The constituents that remain in the milk after skimming and churning are the most expensive ones, considered from the standpoint of feeding and fertilizing value, and it is largely due to this fact that dairy farming is so often a profitable business when conducted in a thorough manner.

The value of dairy by products is not alone in their nitrogenous character. Skim milk or buttermilk to which Davis Stock Food has been added has an effect on the digestion that brings results out of all proportion to the nutritive value and is more valuable than the nitrogenous grains to balance rations. Where pigs have been for a long time on a monotonous ration, such as corn meal alone, they lose appetite, become listless and sick, and so make very unsatisfactory gains. If skim milk and Davis Stock Food are given, even in very small amounts, an immediate change for the better is noticed—appetite returns and the pigs begin to gain rapidly in weight. As already stated, the gain in weight is out of all proportion to the actual amount of nutrient material in the milk, and this peculiarity has been remarked upon, not only when pigs are fed as indicated above, but also when pigs are fed a varied grain ration and skim milk in comparison with others on the grain ration only. Just why dairy by products with Davis Stock Food have this effect is not exactly known, but the suggestion has been made that they keep the digestive system in better order, and thus enable the animal actually to digest a greater percentage of his feed. The same fact has been noticed when roots and green feed are fed. Pasturing of rape, alfalfa, or the grasses probably has a similar though less marked effect.

Snyder's investigations at the Minnesota Experiment Station seem to show that the action of milk is to make the feed more digestible. He found that milk rendered soluble from 1 to 3 per cent of the total insoluble proteids of wheat flour, and attributed its action to the soluble ferment, or enzym, which is normally present in milk. The effect of dairy by products with Davis Stock Food on the carcass is one of the most important results of such feeding. It is generally admitted that, while excellent hams and bacon may be produced without Davis Stock Food and dairy by products, the use of these products will result in pork of a more nearly uniform high quality.

The economy of Davis Stock Food and skim milk feeding in connection with grain has been repeatedly demonstrated. The average results of the Danish experimenters show that when so fed 600 pounds of skim milk has a feeding value about equal to 100 pounds of grain. At the Wisconsin Station the average of nineteen trials, with proportions of milk to grain varying from 1 to 9 pounds of milk for each pound of grain fed, show a value of 475 pounds of skim milk for 100 pounds of meal.

Extensive experiments at the Central Experiment Farm of Canada show a value of milk of about 600 pounds for 100 pounds of gain.

The value of milk with grain is also shown when rations of grain alone and of grain and milk are compared. The average of a series of experiments at the Utah Station shows that where grain alone was fed, in five tests the pigs made an average daily gain of 0.90 pound, consuming 421 pounds of dry matter per 100 pounds of gain; in eight tests, where a grain and milk ration was fed, the average daily gain was 1.27 pounds, and the dry matter per 100 pounds of gain 334 pounds. Results at the Tennessee Station gave an average daily gain of 1 pound for pigs on a corn meal ration, with 416 pounds dry matter consumed per 100 pounds gain; when corn meal and skim milk were fed, the average daily gain was 2.3 pounds and the dry matter per 100 pounds of gain 293 pounds. Two years' additional tests at the same station showed an average daily gain of 0.50 pound and 410 pounds of gain when corn meal only was fed; when corn meal and skim milk were fed, the average daily gain was 1.25 pounds, and the feed eaten per 100 pounds of gain 160 pounds of grain and 1,190 pounds of milk. The cost of 100 pounds of gain was \$5.80 when no milk was given; when milk was fed it was \$4.60. The profit for the group (value of manure and cost of care not being considered) was \$1.05 for the corn meal fed lots and \$4.96 for those fed milk.

Although skim milk is of great value when fed with grain, especially corn meal, it is not a satisfactory feed by itself. Where attempts have been made to maintain pigs on skim milk alone, the gains were small and the returns from the milk fed less than when grain was fed in connection with it. The grain at 75 cents per 100 pounds in field estimates a return for skim milk at 17 cents per 100 pounds when grain and milk are fed the pigs, and only 10 cents per 100 pounds when milk is fed alone.

The quantity of milk may be greater with pigs suckling the dam or newly weaned than with older shoats, but young pigs should not be maintained exclusively on skim milk. The Tennessee Station, feeding pigs averaging from 75 to 100 pounds on rations composed of mixed grain and milk in varying proportions from 1:3 to 1:12, found the best results when the ratio of grain to milk was one to three. The rations containing a large amount of milk were found to be unduly expensive. At the Cornell Station, two experiments showed the best results when the ratio was 1:3 and 1:2.5; in two others, proportions of 1:6.7 and 1:6.2 showed the best results.

When an unlimited supply of milk is available, we recommend the following ration for young and growing pigs, weighing from 20 to 180 pounds:

Rations for Growing Pigs.

Weight of Pigs	RATION
20 to 60 pounds	3 ounces of corn meal, 1 teaspoonful Davis Stock Food to each quart of milk.
60 to 100 pounds	6 ounces of corn meal, 1 teaspoonful Davis Stock Food to each quart of milk.
100 to 180 pounds	8 ounces of corn meal, 1 teaspoonful Davis Stock Food to each quart of milk.

The following rations may be used when the milk supply is in limited amounts:

Rations for Growing Pigs.

Weight of Pigs	RATION
20 to 180 pounds	3 ounces of corn meal, wheat, rye, or hominy meals, 1 teaspoonful Davis Stock Food to each quart of milk, and then gradually increase meal to satisfy appetites.
20 to 60 pounds	Milk at disposal, plus mixture of one-third corn meal, one-third wheat bran, 1 teaspoonful Davis Stock Food, and one-third gluten meal, to satisfy appetites.
60 to 100 pounds	Milk at disposal, plus mixture of one-half corn meal, one-fourth wheat bran, 1 teaspoonful Davis Stock Food, and one-fourth gluten meal, to satisfy appetites.
100 to 180 pounds	Milk at disposal, plus mixture of two-thirds corn meal, one-sixth wheat bran, 1 teaspoonful Davis Stock Food, and one-sixth gluten meal, to satisfy appetites.
20 to 60 pounds	3 ounces of corn meal to each quart of milk, and 4 ounces of gluten feed, 1 teaspoonful Davis Stock Food, as a substitute for quart of milk.
60 to 100 pounds	Milk at disposal and mixture of one-half corn meal, one-half gluten feed, 1 teaspoonful Davis Stock Food, to satisfy appetites.
100 to 180 pounds	Milk at disposal, and mixture of two-thirds corn meal, one-third gluten feed, 1 teaspoonful Davis Stock Food, to satisfy appetites.

Whey also has great value as an adjunct of the grain ration. The average of four experiments at the Ontario Agricultural College gives a feeding value of about one-eleventh of that of corn; that is, 1,100 pounds of whey are worth 100 pounds of grain, when fed in a grain ration. According to the Ontario results souring does not seriously impair the feeding value of whey. The four experiments show very nearly as good results from sour as from sweet whey. The injurious effects which frequently follow whey feeding, and are manifested by stiffening of the joints and rheumatism, were evident among the pigs fed sweet whey, but were entirely absent from those fed sour whey.

The cost of handling feed and caring for live stock has not been very extensively discussed in the literature on that subject. Where only a few pigs are fattened annually the feeder does not notice the effect of wasteful methods, but where large numbers are fed, a minimum of waste in feeding and the

highest efficiency of labor are absolutely essential to profitable results. Dairying and pig feeding are so intimately related that Linfield's investigations on this subject are interesting. Correspondence with various creameries in Utah, where large numbers of pigs are fed, is summed up as follows:

One creamery reports that one man would feed 1,000 hogs, clean all the pens each day, and draw the grain feed from the mill, two miles distant. Another says that one man does all the work of feeding and cleaning out the pens for 500 hogs in five hours each day. The wages paid in each case was about \$1.00 per day.

At both creameries the hogs are purchased when weighing from 50 to 100 pounds each, though some few are heavier. The hogs are crowded from the start, and, at most, when Davis Stock Food is added to keep their digestive organs in good condition, not more than 100 days are required to fit the hogs for market, and in this time 100 to 125 pounds have been added to the live weight of each hog.

By putting all of the above figures together, we find that it costs five hours' labor, or 50 cents, to look after 500 hogs for one day, or \$50.00 to look after 500 hogs for 100 days. This is 10 cents for one hog for 100 days, or for 100 pounds gain, which gives one-tenth of a cent as the labor cost of producing 1 pound live weight of a hog. It is thus evident from the results of these practical men that, when handled in large numbers, as hogs may be at a creamery, the labor is a very small item in growing the hogs. If the value of the gain was reckoned at 4 cents per pound, the labor cost of producing the pork was but 2½ per cent of its selling price.

Lest these results be misleading, Linfield calls attention to the fact that the conditions were almost ideal for the greatest economy—the hogs were short fed and all feeding appliances and pens were so arranged as to have in view the greatest possible saving in labor. At another creamery, where the hogs were raised on the place and fed until they were fifteen months old and the accommodations were not so good, the cost reported was as large for 300 hogs as the other reported for 1,000 head. It is pointed out that on the average farm, where the number of animals is much smaller and milk must usually be hauled back to the farm, the labor cost will be very much greater.

Pasture and P a s t u r e Substitutes.

There is a marked similarity between the effect of dairy by products and pasture on the efficiency of the grain ration of pigs, which is generally out of proportion to the nutrient value of the amount consumed of these supplementary feeds, and is to be accounted for only on the theory that the digestive apparatus is kept in better order by Davis Stock Food and their use, and made more efficient. Except when epidemics are prevalent, and the possibility of contact with contagion induces the feeder to keep his pigs confined, an ample range on pasture will keep them in healthy condition, and enable an amount of rate of gain which well repays for the use of the pasture. The Utah Station has recently published results which confirm previous investigations on the subject. Four years' work shows that pigs on grain alone ate 4.05 pounds of feed daily and made an average daily gain of 0.94 pound, eating 430 pounds of grain for 100 pounds gain. The pigs on pasture with grain ate 4.72 pounds of grain daily, made an average daily gain of 1.21 pounds, and ate 385 pounds of grain for 100 pounds gain. The total gains averaged 33 per cent greater for the pigs on pasture than for those on grain alone. The average daily gains were nearly 29 per cent greater, and there was a saving of more than 10 per cent in the feed required for 100 pounds gain for the pigs on pasture. The larger amount of feed eaten by the pigs on pasture is also noteworthy, for a large consumption of feed generally leads to large gains. The earlier tests at the same station by Linfield were designed to compare the relative merits of pasture and pen feeding when pigs were fed on milk alone, on grain alone, and on milk and grain. The only pigs that showed better results in pens and on pasture were those on grain and on milk. Those receiving grain alone on pasture gave very much larger gains, required less feed per 100 pounds gain, and ate more feed than those receiving grain alone in pens. Linfield suggests that either the exercise or the feed obtained by the run on pasture gave these pigs greater appetite and enabled them to digest a greater amount of feed daily. The fact that neither of the other lots showed a marked advantage from pasture might be explained by the skim milk in the ration. It is perhaps a safe proposition that in feeding pigs the best results will follow the use of dairy by products, roots,

or pasture, in connection with grain, but that it is superfluous to combine two of these supplementary feeds, as their action on the digestive system seems to be similar. When attempts are made to prevent disease, however, the advantage of ample exercise must not be overlooked.

Pasture is hardly, if at all, a maintenance ration, and, as the profits in feeding come from a continuous gain until the animals are sold, such a ration should be resorted to only under the pressure of extreme necessity, when the saving of grain is imperative. According to Henry, no station has shown that pigs can be successfully maintained on pasture alone, if a former test by Mills, at the Utah Station, be excepted. Two later tests at this station by Foster and Merrill, for periods of over 100 days, where four lots of pigs were pastured on alfalfa, or mixed grasses, showed actual losses with two lots and very slight gains with the others, the average daily gain amounting to 0.189 pound in one case and 0.059 pound in the other. The effect of this method of feeding on the appearance of the pigs was very marked; in the 1898 test it was particularly commented upon. The plump, rounded forms gave place to large, coarse frames and large stomachs. At the end of the experiment they looked very much larger than at the beginning, but the scales failed to show any gain. What is said above would also apply to the mixed pasture set, only in that case the eye was not so badly deceived—small gains were made. In 1899, pigs that were receiving small amounts of feed, either milk or grain, in addition to pasture, were found to have made gains very nearly in proportion to the amount of extra feed given, which Foster and Merrill regarded as evidence that the pasture supplied enough feed for maintenance only.

Tests at the Oklahoma Station showed a total gain of 68 pounds for four pigs in eight weeks—17 pounds each—where pigs were on pasture alone, while four others on pasture with a grain ration gained 324 pounds in the same time, an average of 81 pounds.

A sow with a litter of five pigs was in the same lot with the grain fed pigs. The sow gained 61 pounds in thirty-five days, when she was removed. Her five pigs made a total gain of 146 pounds in the first five weeks, and 96 pounds during the succeeding period of three weeks. The grain fed these pigs amounted to only 221 pounds per 100 pounds of gain.

In addition to tests mentioned in a preceding paragraph, experiments by Linfield at the Utah Station show that when pigs are receiving a grain ration with dairy by products the addition of pasture is unnecessary and adds nothing to the effectiveness of the ration or the gains made. The average of four experiments shows average daily gain of 1.03 pounds where pasture was allowed; these pigs consumed 1,544 pounds of milk and 236 pounds of grain per 100 pounds of gain. The pigs without pasture consumed 1,827 pounds of milk and 218 pounds of grain per 100 pounds gain, making an average daily gain of 1.06 pounds. The amount of feed consumed daily by the pigs on pasture was somewhat less than in the case of those without it. The only advantage noticed from the pasture was in the case of two lots which received skim milk only, but no grain. In the experiments where grain was fed no advantage accrued to the use of pasture, except that the pasture lots consumed nearly 300 pounds less milk per 100 pounds gain than those in pens. At 15 cents per 100 pounds this means a difference of 45 cents per 100 pounds of pork made. The difference in grain fed was nearly 20 pounds per 100 pounds of pork made in favor of the pen fed lots.

These results are evidence in support of the idea that the effect of dairy by products and succulent feed in the ration is similar, and that to get the greatest amount of gain at the least expenditure of feed only one of the supplementary feeds is necessary; that the addition of pasture to a ration which already contains a large amount of dairy by products is superfluous, and that the only advantage to be gained by such a method of feeding is the exercise obtained by the pigs on pasture.

Green Substitutes for Pasture.

The lack of a permanent pasture should not deter the prospective pig feeder from engaging in the business. A prominent feature of the recent development of the industry has been the increasing use of succulent feeds, such as cereals, rape, vetches, cow peas, sorghum, etc., which yield large amounts of feed per acre and also enable the feeder to grow his season's pasturage on a small amount of land by means of a succession of crops. Not only does this make successful pig feeding when only a limited amount of land is available, but, by restricting the amount of grain allowed the hogs, removes to a great extent the objection to pasturage when exposure to disease is to be feared, yet permits the

advantages of exercise and succulent feed. Rape has been most generally used for this purpose, and experiments have been reported recently by the Utah and Alabama Stations and by the Central Experimental Farm of Canada. The gains at the Canada Station were particularly good, averaging 1.27 pounds daily, the pigs eating 238 pounds of grain per 100 pounds gain. In the Alabama test the average daily gain was 0.56 pound and the feed per 100 pounds of gain was 238 pounds. In the Utah test the average daily gain was 0.204 pound and the feed per 100 pounds gain 490 pounds.

At the close of the Alabama test the pigs were placed on second growth rape for three weeks. They grazed one-sixth acre, eating 168 pounds corn meal and making a gain of 82 pounds, which was an average daily gain of 0.98 pound, at a cost of 205 pounds meal per 100 pounds gain. Assuming that 500 pounds of grain alone are required for 100 pounds gain, Duggar estimates the amount of the pork produced per acre from the first and second growth rape together at 512 pounds, worth at that time \$20.48.

Seven shoats, averaging 41 pounds in weight, were on rape at the same station for four weeks during the late spring. They received some corn meal in addition. During the first two weeks the rape was fed to the pigs in the pens; during the remainder of the time they were hurdled. They ate 318 pounds of corn meal. The total gain in weight for the four weeks was 103 pounds, an average daily gain of 0.53 pound, 310 pounds of grain and 4,050 square feet of rape being required to produce 100 pounds of gain. Compared with clover, the Wisconsin Station found in two tests that pigs receiving a grain ration and hurdled on rape made larger and more economical gains than those on the same grain and hurdled on clover.

The same station fed two lots of pigs on rape alone for two weeks. Two lots of eighteen pigs each were taken from rations composed of grain exclusively, grain and clover, and grain and rape. They were given nothing but rape. They fed nearly all day, appeared contented, and scoured but little, but twenty-five of the thirty-six lost in weight during the two weeks they were on rape, and only four made gains. The total loss on thirty-six pigs was 60 pounds, or at the rate of 1.66 pounds per pig. The six pigs that had been on an exclusive grain diet lost 18 pounds, or 3 pounds each. The eight pigs that had been on grain and clover lost 19 pounds, an average of nearly 2.33 pounds each and the twenty-two pigs that were taken from a grain and rape diet lost 33 pounds, or 1.5 pounds each.

Pasture Substitutes in Southern States.

One of the most promising features of animal husbandry in the South is the large range of forage crops at command. The hog raiser is particularly benefited by these crops, many of which may be sown annually and used as substitutes for pasture. The most common Southern grazing crops for pigs are peanuts and cow peas. Both are very highly nitrogenous and therefore are good crops to use as a supplement to a ration composed of corn, rice products, or other carbonaceous feeds. In addition to cow peas and peanuts, chufas, sorghum, soy beans, velvet beans, rape, sweet potatoes, etc., are used for pig grazing. The method of grazing is usually that of hurdling; that is, the pigs are enclosed on a small part of the field by means of portable fences. These fences are moved to ungrazed parts of the field as plants are eaten. Nearly all the efforts of the stations have been confined to demonstrations of the feasibility of pig feeding in the South and the possibilities of grazing the forage crops which are found in that section. The Arkansas Station made pork at the rate of 1,252 pounds per acre for peanuts, 592 pounds per acre for chufas, and 436 pounds per acre from corn, estimating the yield of corn at 30 bushels per acre. The forage crops were hurdled and the corn fed dry in the ear. In other tests at the same station both peanuts and chufas gave especially good gains. The Alabama Station raised six Poland China pigs on peanuts, with some corn in addition. The lot made a gain of 380.7 pounds in six weeks on an area of about one-sixth acre and ate 373 pounds of corn. Estimating corn at 49 cents per bushel and pork at 3 cents per pound, this is a return of \$18.34 per acre for peanuts from this method of feeding.

On a portion of the field which was not pastured the peanuts were dug and yielded at the rate of 62.6 bushels (1,565 pounds) of dry nuts per acre. From this the total feed required to produce 100 pounds gain was estimated as 140 pounds of peanuts and 190 pounds of corn, a total of 330 pounds of concentrates, with vines eaten not estimated.

This station estimates the value of return from peanuts in pork at \$18.00 per acre, and states that the same land with the same fertilizers would not produce over 200 pounds of lint cotton per acre, which would be worth \$10.00 or \$12.00, with cotton at 5 or 6 cents per pound, while the expense of cultivating cotton would be much greater. In a latter experiment Duggar penned a litter of nine weeks old pigs on a two-thirds stand of Spanish peanuts just after weaning. They were on this pasture from November 4th to December 23rd, and ate 152 pounds of corn meal for 190 pounds gain, in addition to grazing about five-sixths of an acre of peanuts. At 4 cents per pound for pork and making allowances for the grain eaten, the return per acre for the peanuts was \$10.04.

In another test the sow and her litter of nine pigs were fed from September 30th to November 4th on corn meal, skim milk and Spanish peanuts from one-fourth acre of land. They ate 355 pounds of corn meal and 921 pounds of skim milk. The sow and pigs gained a total of 236 pounds. At 4 cents per pound for pork, valuing corn meal at \$1.00 per 100 pounds and skim milk at 35 cents per 100 pounds, and estimating 325 pounds of skim milk to be worth 100 pounds of corn meal, the return per acre from the peanuts was \$17.28.

In another test seven shoats, averaging nearly 100 pounds, were penned on Spanish peanuts from October 11th to November 2nd and fed some corn meal. They made a total gain of 225 pounds, eating 286 pounds of corn meal and grazing the peanuts on 0.47 acre, requiring only 127 pounds of corn meal for 100 pounds gain. With the usual allowances, the return per acre for peanuts in this test was \$18.02.

In another test seven shoats were taken from corn meal, cow pea meal, and sorghum, and placed on Spanish peanuts and corn meal for four weeks. They ate 333 pounds of corn meal and grazed 1,593 square feet of peanuts, making a gain of 121 pounds, which was at a cost of 273 pounds grain for 100 pounds gain. The value per acre of the peanut pasture was estimated, by the usual methods, at \$9.00.

Some of these pigs were continued by hurdling on peanut pasture and were given some grain in addition for five weeks longer. In this period the return per acre for the peanuts was estimated at \$9.88.

In another test, a litter of seven Poland China pigs, averaging 28 pounds in weight, were hurdled on Spanish peanuts just after weaning. The pasturing continued six weeks and no grain was fed. The total gain was 157 pounds, an average daily gain of 0.53 pound. The area grazed was 13,887 square feet, and the return per acre, with pork at 4 cents per pound, was \$20.12.

The Alabama Station fed one lot of pigs on a peanut field which was a poor stand, giving some corn meal in addition; another lot had nothing but the peanut pasture, and a third lot corn meal only. There were three pigs in each lot and they were of rather ordinary feeding qualities. In four weeks the lot on corn meal gained 38.6 pounds, those on peanuts alone gained 21.1 pounds, and those on corn meal lost 5.1 pounds. The lot on peanuts and corn meal ate 206 pounds of corn per 100 pounds gain and grazed 2,025 square feet planted in peanuts. This is at the rate of 840 pounds of growth from one acre of peanuts (with less than half a stand) and 1,710 pounds (35.6 bushels) of corn meal. With pork at 3 cents per pound and corn meal at 40 cents per bushel of 48 pounds, this is a gross return of \$25.20 and a net return (after subtracting the value of the meal) of \$10.94 per acre of peanuts.

The pigs on peanuts only pastured an area of 3,517 square feet, and the gain made was 21.1 pounds, which is at the rate of 261 pounds of pork per acre. At 3 cents per pound gross for pork, this gives a value of \$7.83 to the acre of peanuts on which there was only half a stand of plants.

The Alabama Station estimates the value of peanuts in pork production at \$12.00 to \$20.00 per acre, the higher returns being made where corn meal supplements the peanut pasture.

In another test at the Alabama Station, pigs grazing peanuts, with a half ration of a mixture of corn meal two parts and cow pea meal one part, pigs grazing peanuts alone, and pigs grazing chufas with the half grain ration mentioned, were compared with pigs on a full ration of the same grain mixture, fed in a bare lot. All lots but those grazing peanuts alone made very good gains. The pigs on peanuts and grain made an average daily gain of 1.50 pounds, requiring 188 pounds grain for 100 pounds of gain. Those on chufas and grain made 1.46 pounds average daily gain and ate 192 pounds grain per 100 pounds gain. The grain fed pigs gained 1.31 pounds daily per head, eating 431 pounds of grain per 100 pounds

of gain. The pigs on peanuts only made an average daily gain of 0.46 pound, showing that the best results may be had when grain is fed with peanuts. The return per acre of peanuts and chufas, with pork at 4 cents per pound, was estimated, where grain was fed, at \$9.56 and \$9.62, respectively. The pigs on peanut pasture without grain returned only \$3.03 per acre for the crop. At the rate of gain made in this experiment it is estimated that with these rations one acre of the grazing crop would provide feed for a 100-pound shoat as follows: Peanuts and grain ration, 850 days; chufas and grain ration, 827 days; peanut pasture alone, 463 days.

The value of sorghum and cow peas as grazing crops was investigated by the Alabama Station. One lot was hurdled on drilled sorghum which was in the dough and ripening stages and received a half grain ration of a mixture, by weight, of corn meal two parts and cow pea meal one part. Another was placed in a pen in which sorghum was growing and had, in addition, enough ripe Spanish peanuts to constitute a half ration of peanuts. A third was hurdled on drilled Whippoorwill cow peas, on which part of the pods were ripe, and received no grain. The fourth was confined in a bare pen and given the grain mixture given lot 1 in such amounts as the pigs would eat up clean.

The results were not very satisfactory for grazing on sorghum or on cow peas without a supplementary grain ration. The waste of feed in the cow pea lot was very great, large numbers of the ripe peas falling to the ground and sprouting. Previous work at the Alabama Station has shown more satisfactory results when grain was fed in conjunction with the cow pea pasture.

Duggar notes another experiment with sorghum grazing, in which there was a large waste of feed, although grain was fed. Seven shoats were on the sorghum from June 24 to September 2, 1899, and received at the same time about 1.5 pounds per head daily of a mixture of equal parts by weight of cow pea meal and corn meal. The pigs grazed 15,374 square feet of sorghum and 8,380 square feet of second growth sorghum. They ate 812 pounds of grain, or 360 pounds of grain per 100 pounds of gain. Making allowances for the value of the grain fed, the return per acre of sorghum, with pork at 4 cents per pound, was estimated at \$7.80. The second growth sorghum produced only about one-half as much feed as the first growth. Large quantities of the sorghum were trampled under foot, and, when some of it was cut and carried to the pigs, a given area lasted much longer than when they were turned in to graze. Duggar suggests that when labor is cheap and abundant, or a corn harvester is available, soiling sorghum will be the more profitable method of feeding.

An earlier experiment at the Alabama Station gave more profitable results from a ration of grain and cow pea pasture. One lot of pigs had corn only; another was hurdled on cow peas about half matured at the beginning of the experiment, and given corn. The cow peas yielded about 13 bushels of peas per acre. The pigs on corn alone made an average daily gain of 0.36 pound, eating 586 pounds of grain per 100 pounds of gain. Those on cow pea pasture, with corn, made an average daily gain of 0.97 pound, eating 374 pounds of corn per 100 pounds of gain.

The pigs were pastured on an area of 7,280 square feet, or about one-sixth of an acre. Valuing pork at 3 cents per pound and corn at 40 cents per bushel, the return of cow peas per acre was estimated at \$10.65, not including the value of the manure made. By pasturing, 277 pounds of corn was saved per 100 pounds of gain, and therefore an acre of cow peas would replace 1,662 pounds of corn, using this test as a basis.

The Maryland Station fed a number of pigs on cow pea pasture and concluded that cow peas are well adapted to pigs about three months old. The older pigs that had been highly fed and had always been kept in a pen evidently had lost their rustling ability and did not thrive so well on cow peas.

The abundant variety of forage plants at the command of Southern farmers led Duggar to suggest a succession of grazing crops which could be planted in the milder portions of the South, so that pasture would be available from January to December. The following table shows the crops suggested, using the results of investigation by the Alabama Station as a basis. It is said that other forage crops will be added as they are tested, such as alfalfa, pumpkins, artichokes and soy beans.

Succession of Forage Crops.

MONTHS TO BE USED	CROPS
January and February	Fall sown rape and chufas.
March 1 to April 15 . . .	Fall sown rape, vetches and oats, rye, wheat, etc.
April 16 to May 1	Vetches and oats, crimson clover, oats and wheat.
May	Spring sown rape, vetches and oats, wheat, and the usual pastures.
June	Spring sown rape, stubble field, turf oats, and the usual pastures.
July and August	Sorghum, early variety of cow peas, and the usual pastures.
September, October and November	Spanish peanuts, cow peas, sweet potatoes and sorghum.
December	Chufas and full sown rape.

A disadvantage of grazing pigs on peanuts or chufas, the effects of which must be guarded against by the Southern feeder, is that the lard from such pigs has a very low melting point; the fat, therefore, makes the flesh soft, flabby and undesirable in appearance, especially during the summer months. To obviate this difficulty, the common practice of farmers is to use corn in finishing hogs which have had peanuts as the principal component of ration. Recently the effect of cotton seed meal on the fat has been investigated with good results so far as increased firmness of the pork produced is concerned.

According to Bennett, if good grade or pure bred pigs are grazed on peanuts or chufas, either alone or combined, and if at the same time they are fed on an amount of corn sufficient to full feed exclusively, for four weeks, the quality of the pork and lard produced cannot be distinguished in appearance from that of pigs fed on corn exclusively. Bennett regards the use of more than this amount of corn as too expensive for the results obtained. He also reports that his results have shown that pure bred pigs or good grades produced a firmer quality of pork and lard than scrubs. The range of individual variation in the melting point of lard from scrubs was much larger than that of the lard from grades of pure breeds. Duggar, however, states that in his experience, even when fed a month exclusively on corn, pigs formerly on peanuts made much more oily and soft pork and lard than those fed corn throughout the entire feeding period. This condition was noticeable even after cooking. One month of exclusive corn feeding increased the firmness of pork made from animals previously fed on peanuts alone, but the improvement was not sufficient to make the flesh or the lard as firm as the same articles afforded by animals fed entirely on corn. Both Bennett and Duggar state that, while exclusive peanut feeding injures the sale of lard and pork by making it soft and oily, the cooking quality does not seem to be impaired.

It is also given as the experience of both these stations that feeding exclusively on corn for a month after the feeding on peanuts was stopped did not have an effect on the melting point of the lard that was appreciably different from that of hogs fed on corn simultaneously with the peanut grazing. The melting point is lower in the case of immature pigs than with mature ones. The hardening effect of other feeds than corn and of combinations of these feeds with corn has been studied extensively by the Alabama Station, where a pig that was fed a ration of one-third ground cow peas and two-thirds corn meal was compared with pigs which had grazed sorghum, peanuts or chufas, with and without grain. The melting point of the fat of the jowl was found to be 4.6 degrees Fahrenheit higher than in the case of pigs which had the same grain ration but had grazed peanuts and sorghum, and still higher than that from pigs which had grazed cow peas. A number of experiments show that a ration in which cotton seed meal entered to the extent of one-fourth had a marked effect on the hardness of the fat.

Pumpkins and Apples.—Farmers generally regard pumpkins highly as a fall pig feed. They are succulent, palatable, and nutritious, and, properly fed, give profitable returns. Experiments at three stations, where the utility of cooking pumpkins was studied, show that the practice added little to the efficiency of the ration. The gains from feeding were good in all cases and economically produced. Pigs fed on raw pumpkins and grain showed gains at a cost of 262 pounds of grain and 376 pounds of pumpkins per 100 pounds of gain where the pumpkins were fed raw, and 222 pounds of grain and 1,150 pounds of pumpkins for each 100 pounds of gain when they were cooked.

Three pigs, averaging 141 pounds at the beginning of the experiment, fed pumpkins alone at the New Hampshire Station for twenty-five days, made an average daily gain of 1.12 pounds, the cost of food per 100 pounds of gain being \$2.39.

Another test at the same station with a ration of cider or wind fall apples and pumpkins, equal parts, cooked, showed but expensive gains, the high cost being attributed to the apples.

Roots and Tubers.—Feeding roots to live stock is comparatively recent in the United States. Corn, with hay or ensilage, has been the principal maintenance during the winter months when pasture was not available. In hog feeding it is safe to say that, until very recent years, almost the only substitutes for pasture were pumpkins, artichokes, and clover or alfalfa hay in certain sections. In England and Canada, however, much dependence is placed on roots, and, while we may never reach the point in this country generally of fattening animals almost entirely on a root diet, the peculiar advantages to be gained by them, their great palatability, and the good effects on the health and thrift of the animals commend roots to the stockman.

A number of experiments have been reported recently on feeding roots to hogs.

At the Indiana Station, Plumb and Van Norman conducted two experiments to compare a ration composed solely of grain with one where roots were added. In both experiments the grain ration was one part corn meal, two parts shorts, fed as slop. No drink other than water was given. In the first experiment mangels were fed; in the second the roots were sugar beets, sliced and fed in the slop, and they were relished more than the mangels.

At the Ontario Agricultural College, Day fed four lots of pigs in pens as follows:

Lots 1 and 2 were made up of four grade Yorkshire pigs, each from the same litter, about seven weeks old; lots 3 and 4 contained five grade Yorkshire pigs, each from the same litter, about nine weeks old. Lot 1 received barley and middlings; lot 2 received barley and middlings with an equal weight of raw pulped mangels; lot 3 received corn and middlings; lot 4 received corn and middlings with an equal weight of raw pulped mangels. The proportion of grain in middlings was 1:2 in all lots at the beginning of the experiment, and was gradually changed as the pigs increased in weight and age until it was 2:1 toward the close.

At the Utah Station, Foster and Merrill conducted two experiments to compare the ration of bran and sugar beets with rations of corn meal, ground wheat, and corn meal and peas. In the first experiment lot 1 received corn meal, lot 2 received ground wheat, and lot 3 received sugar beets with a one-third ration of bran. In the second experiment lot 1 received a mixture of equal parts of corn meal and ground peas, lots 2 and 3 being fed as in the first test. The pigs were fed in covered pens, and were given all they would eat. There were three in each lot.

At the Montana Station, Shaw fed one lot of hogs on grain only and another on the same grain ration with sugar beets added.

The Indiana results showed larger and more rapid gains in both cases for the pigs receiving no roots, but in one test there was a saving of 72 pounds of grain for 100 pounds of gain by feeding 410 pounds of roots. The Ontario and Montana results favored root feeding in all respects. The gains were larger and more rapid, and less feed per 100 pounds of gain was required when roots were fed. The average of these experiments shows that in six out of seven tests where roots were fed there was a saving of the grain.

The average of feed per 100 pounds gain shows that feeding 427 pounds of roots saved 83 pounds of grain, or 19 per cent, which is a very high value for roots.

The feature of root feeding has previously been remarked upon in this book. Attention is called to it in nearly every instance where experimenters have fed roots successfully. Plumb and Van Norman do not regard their results as showing great value for roots, but think they have an effect on the appetite, digestion, and general health that is beneficial, particularly in winter. In the Ontario experiments the equivalent for 100 pounds of meal was 319 pounds of roots in the first and 564 pounds in the second. Day calls attention to the fact that both figures are very high values for roots, and points out that, according to analyses and digestion experiments, there is approximately about nine times as much digestible matter in a mixture of corn and middlings as there is in mangels. It is difficult to explain, therefore, how 564

pounds of mangels should prove equal to 100 pounds of meal. The pigs receiving mangels showed the effects of their feed in more growth and thrift than the others. They had less tendency to become fat, and the root ration was reduced for this reason. Day explains this effect of root feeding to be due to a beneficial effect on the digestive organs of the animals, causing them to digest their feed better than did the others; for there is little doubt that hogs closely confined in pens are likely to suffer from indigestion. Shaw explains the marked effect of roots in similar words, stating that the value of sugar beets for pigs is derived not so much from the nutrients in the dry matter which they contain as from the influence they exert on digestion and assimilation.

Henry found the results at three American experiment stations to be that about 615 pounds of roots saved 100 pounds of grain. The Danish experiments give 600 to 800 pounds of mangels and from 400 to 800 pounds of fodder beets as the feeding equivalent of 100 pounds of grain.

The average of the results here given indicates that about 515 pounds of roots saved 100 pounds of meal, a somewhat higher value for roots than that given in previously published works.

More extended experiments by other stations showed an average daily gain for pigs of 1.58 pounds, at a cost of \$4.60 per 100 pounds gain, on grain only (9.11 pounds of grain per head daily); the second lot, on grain and sugar beets (6.65 pounds grain and 4.58 pounds sugar beets per head daily), made an average daily gain of 1.64 pounds, at a cost of \$3.80 per 100 pounds. There were four pigs in each lot, and they were fed fifty days. As a side light on the possibilities of pork production in the irrigated Northwest, it is interesting to note that Shaw found his net profits from feeding these eight pigs to be \$14.12, or 33 per cent on the investment in fifty days.

In an experiment to compare the feeding value of forage beets, sugar beets, mangels, and turnips, at the Central Experiment Farm of Canada, when pigs received a ration of mixed grain, the pigs on forage beets made the greatest average daily gains and required the least feed for 100 pounds gain, the other lots standing in the order of sugar beets, mangels, and turnips. The results are remarkably low in feed requirements, and would seem to show that roots and milk may be more advantageously combined than pasture and milk.

Day, at Guelph, and Shutt, at Ottawa, have found that the effect of roots on the carcass is not detrimental, but produces a firm bacon of good quality, a very essential matter to Canadian pig feeders. In this experiment neither buyers nor packers criticized adversely the pigs fed on turnips and mangels, and the carcasses of the sugar beet pigs were all select (there was no packer's report on this lot); but the buyer found one carcass too fat in the lot fed on forage beets, and the packer's report was not so favorable as on the others.

An attempt at the Colorado Station to maintain pigs on sugar beets alone was successful only in maintaining them without loss. The ration proved expensive and there was difficulty at first in inducing the pigs to eat beets, but after they became accustomed to such a diet they took to it readily. At no time were they able to eat beets enough to approach the conventional feeding standard; 12.5 pounds daily was the greatest amount they would take.

An experiment at the same station, when sugar beets and sugar beet pulp were compared, showed that the whole beets had greater feeding value than the pulp, but both rations were inferior to one of the mixture of equal parts of wheat and barley, so far as amount and rate of gain and profits were concerned, although the pigs on beets or pulp received the same grain ration as the lots on grain alone. The beet and pulp rations required less grain for 100 pounds of gain than the grain ration, and the pulp ration cost 20 cents less per 100 pounds gain than the grain ration, but the profit on the latter lot was greater. The pigs ate pulp with considerable reluctance, and did not seem to relish the beets at first.

Clinton reports an unsuccessful attempt at Cornell to feed potatoes, raw and cooked. Some grain and skim milk were given in addition; but, while over 400 pounds of potatoes were eaten, the pigs made no progress and were getting out of condition when the experiment was brought to a close. The low temperature while the pigs were being fed, ranging between 29 and 30 degrees Fahrenheit, is suggested as a reason for the poor results.

At the Central Experiment Farm, very satisfactory results were obtained from cooked potatoes, but raw potatoes produced little gain. In one experiment the pigs were getting all the raw potatoes they would eat, but made no gain, and the tubers were discontinued. In a second test a similar

experience led to a change to cooked potatoes. The opinion of investigators at this station is that raw potatoes are of little value for feeding pigs, but when cooked they are worth about one-fourth as much as mixed grain.

The Alabama, South Carolina, Maryland and Florida Stations have experimented with sweet potatoes with somewhat varying results. At the Alabama Station, Duggar fed one lot of pigs on a ration of three-fourths sweet potatoes and one-fourth ground cow peas, and another on a ration of equal parts of corn meal and cow peas. After four weeks they were put through an intermediate period of one week and the rations were reversed, the lot that had formerly been on corn meal and cow peas receiving the sweet potato ration. This was continued for four weeks longer, so that in all there were eight weeks of feeding on a sweet potato ration.

The ration of sweet potatoes and cow peas proved very inferior to the ration of corn meal and cow peas. The increase in live weight was nearly twice as great in the case of corn meal and cow peas, and the dry matter per 100 pounds of gain was estimated at 600 pounds where sweet potatoes were fed to 360 pounds where corn meal was fed. Duggar refers to the difficulty of inducing the pigs to eat dry matter when sweet potatoes made up so much of the ration, and suggested a ration of equal parts of cow peas and sweet potatoes as being more palatable and nutritious. He questions whether sweet potatoes can be profitably grown, stored and fed to hogs unless the feeding value per bushel would be more than 10 or 15 cents. Where the pigs do the harvesting, especially on sandy soils, where the yield of sweet potatoes is ten or fifteen times that of corn, they may be an economical feed.

The results at the South Carolina Station were much more favorable to sweet potatoes. Newman and Pickett fed a lot of three pigs, averaging 162 pounds in weight, on sweet potatoes only for forty-three days, beginning November 23rd. At the same time corn was fed to three pigs averaging 156 pounds in weight. Two pigs in each lot were high grade Berkshires and the third was a grade Duroc Jersey.

Pigs on sweet potatoes ate 26.2 pounds per head daily and made an average daily gain of 0.86 pound. They ate 3,247 pounds of sweet potatoes for 100 pounds of gain.

The pigs on corn ate an average of 9.2 pounds of grain daily, and made an average daily gain of 1.39 pounds, requiring 602 pounds of corn for 100 pounds of gain. It was estimated that at 200 bushels per acre sweet potatoes would produce 369.5 pounds of pork per acre, worth \$18.47 when pork is worth 5 cents per pound. The gain from corn was 139.5 pounds of pork, and the corn yield was 15 bushels per acre on land similar to that on which the sweet potatoes were grown. At 5 cents per pound for pork, the money return for the corn was \$6.97 per acre.

The Maryland Station reports an attempt to maintain pigs exclusively on sweet potatoes. A lot of rather mature pigs was put on a ration of small sweet potatoes and strings, which were fed raw twice a day for thirty-one days. It required over five tons of these potatoes for 100 pounds of gain, and the return from them was only about \$1.60 per ton.

The value of this feed when given with grain was tested with a younger lot of pigs for thirty days. With this lot 593 pounds of sweet potatoes, 277 pounds of milk, and about 60 pounds of grain were required for 100 pounds of gain, and the value per ton of the potatoes was estimated at \$2.40, showing sweet potatoes to be more valuable when fed with grain and milk.

The Florida Station fed a lot of four native hogs on a ration of equal parts, by weight, of sweet potatoes and wheat middlings, the ration being 3.5 pounds of each per 100 pounds live weight of hog. They were confined in an open pen and fed twice daily. The hogs averaged 101.5 pounds at the beginning of the test and increased in weight 31.16 per cent, or 126.5 pounds, at a cost of 5.6 cents per pound of gain for feed eaten.

At the Alabama Station, Duggar penned two shoats, averaging 116 pounds, on sweet potatoes for thirty-five days. They were given, in addition, 2 pounds of ground corn and 1 pound of ground cow peas per head daily. In the time specified they gained 67 pounds, an average daily gain of 0.93 pound, thus requiring 315 pounds of grain in addition to the sweet potatoes for each 100 pounds gain. Duggar states that the sweet potatoes were not relished greatly and that there was much waste of them, due probably to the relatively large amount of grain fed.

At the Oregon Station, French took six Berkshire pigs from wheat stubble on October 22nd and placed them on a field of artichokes that had been planted in April, on deep plowed ground, prepared as for potatoes, in rows 3 feet apart, with the seed 18 inches apart in the row. The growth was vigorous and the yield abundant, the tops growing to a height of 7 feet during the season, and a trial plot showing a yield of 740 bushels per acre. The pigs had free access to the field and did all the harvesting. An attempt to sustain them entirely on the tubers failing, some shorts were fed in addition.

At Ottawa, Grisdale sowed a plot of one-sixteenth acre with about 70 pounds of tubers on May 19th, planting in rows 20 inches apart, 4 inches deep and 20 inches apart in the row. Six pigs were turned in October 3rd. Although the tubers were immature at that time, the tops were from 10 to 13 feet high. The pigs were allowed a daily grain ration of 1.5 pounds of a mixture composed of one-half corn meal and one-half of a mixture of equal parts of ground oats, peas and barley.

In the Oregon experiment the pigs made an average daily gain of 0.81 pound for fifty days, eating 309 pounds of grain per 100 pounds of gain, at a cost of \$1.85; in the Canadian test the pigs made an average daily gain of 1.57 pounds for twenty-one days, eating 96 pounds of grain per 100 pounds of gain, which cost \$1.80.

The cost of the meal in the Oregon experiment was estimated at \$12.00 per ton; that in the Canadian at \$18.00 per ton. Valuing the meat made at \$6.25 per 100 pounds, Grisdale estimates that, after deducting the cost of the meal fed, a balance of \$10.61 is left for the artichokes fed, and, deducting from this the cost of seed, planting, rent of land, etc., the one-sixteenth acre used gave a net return of pork worth \$8.76.

Roughage.—Hogs are generally regarded as animals whose particular function is the conversion of concentrated feed into meat. Although the capacity of bulky feed that we find in the stomachs of cattle and sheep is lacking in hogs, a reasonable amount of bulk in the form of roots or hay is palatable and profitable. In many parts of the country where concentrates are costly feed, stockmen are forced to use substitutes for at least a part of the grain ration, both for fattening and maintenance, and over the entire country the winter ration is a problem. To solve these problems many Western farmers have resorted to the use of alfalfa hay, and outside of alfalfa districts clover hay is used. Considerable study has been devoted to this subject by the experiment stations.

The Kansas Experiment Station has reported a series of experiments with drouth resistance crops. Three of these experiments had to do with alfalfa hay. In the first, the hogs used were of mixed breeding, Berkshire and Poland China, representing about the average of Kansas farm hogs. The alfalfa was of good quality.

Two lots were fed, one receiving the hay whole in greater quantity than it would consume, the other having ground hay. In the second test the meal fed lot received some cotton seed meal—0.16 pound to each pound of Kaffir corn—which did not affect the hogs seriously. This test was conducted during the most severe weather of the winter, the thermometer registering 32 degrees Fahrenheit below zero February 12th, ten days after the experiments began.

In the third test the grain was wet with water at the time of feeding. The alfalfa hay had been cut late and was rather woody.

The Utah Station fed one lot of hogs on a mixture of equal parts, by weight, of chopped wheat and bran, wet. Another lot had the same grain ration with chopped alfalfa hay added. The alfalfa used was well cured and was prepared by running through an ensilage cutter, the blades of which are arranged for cutting into half-inch lengths. The pigs were thrifty grade Berkshires.

The Montana Station fed three lots of hogs to compare the feeding value of a grain ration with sugar beets and alfalfa hay as a roughage with a ration of grain only. The lot on grain alone received a ration consisting, during the early part of the experiment, of two parts of damaged wheat and one part of oats, barley taking the place of the wheat during the latter part of the experiment. The hay fed lot had the same ration with alfalfa hay added. The alfalfa hay was run through a cutting box, moistened, and mixed with meal. The hogs were by a Berkshire boar, out of high grade Poland China sows. They had previously had the run of a stubble field with some clover pasture.

The average of these experiments shows that 593 pounds of grain were required for 100 pounds of gain when no hay was fed, and 505 pounds of grain and 89 pounds of alfalfa hay when hay was fed, a saving of 88 pounds of grain to be credited to the hay fed.

In all but two instances a considerable saving of feed was found to be effected by its use, but the statement that its feeding value is almost equal to that of corn is true only within certain limits. Where hogs are confined to an exclusive grain ration, and especially where this is made up of a single grain, the addition of Davis Stock Food and a moderate amount of hay to the ration will be relished and less grain will be required.

At the same time better and cheaper gains are usually made by hogs so fed than by those on grain alone, but the value of the grain saved is out of all proportion to the value of the hay fed, and the hay in the ration cannot be used economically in more than very moderate amounts. This is a similar fact to that which has been found by many investigators with such bulky feeds as green clover, rape, roots, and skim milk. That it is bad economy to attempt the maintenance of hogs on alfalfa hay alone is shown by an experiment by McDowell, in Nevada.

In this experiment two lots of two pigs each were fed on a ration of alfalfa hay. The two lots ate in twenty-one days 99.12 pounds and 99.14 pounds, respectively, and lost in weight 33.25 pounds and 51 pounds, respectively, an average daily loss of 0.79 pound and 1.21 pounds, respectively. While feeding hay alone the pigs spent much time curled up in the bedding, but when about the stalls were restless, and even in eating it was done in a ravenous way, unlike that of a hearty, well fed pig. After the hay feeding period both lots were given grain and roots and made satisfactory gains.

A consideration of the approximate proportions of hay to grain fed in these experiments is of interest. The greatest proportion of hay to grain was fed at the Canada Station and the ratio was 1:2.5. With this ratio the least daily gain was made. The gains were the most expensive of any of the lots, and no advantage accrued from the use of hay. The least proportion of hay (1:11) was fed at Utah and gave the most economical gains. The greatest daily gain and the greatest amount of grain saved was in a Kansas lot fed whole alfalfa hay and dry Kaffir corn meal in the proportion of 1:7. The following table shows the effect of these rations in greater detail. The best results seem to come from the use of hay in the proportion of from one-seventh to one-fourth of the ration when hay makes up all the roughage.

Ratio of Hay to Grain in Feeding Hogs.

RATIO OF HAY TO GRAIN	Average Daily Feed, Pounds	Feed per 100 Pounds Gain		Grain Saved, Pounds
		Grain, Pounds	Hay, Pounds	
Kansas.				
1:2.5 .....	.88	538	214	1.8
1:4	1.37	501	131	139
1:4	1.37	516	123	137
1:7	1.44	515	72.4	234
1:7	1.32	538	78.7	211
Montana.				
1:7	1.19	486	67	46
Utah.				
1:11	1.19	455	41.7	9

The average of experiments at the Utah and Montana Stations shows sugar beets to be more valuable as a roughage than alfalfa hay. Pigs on hay and grain required 423 pounds of grain and 122 pounds of hay for 100 pounds of gain; those on beets required 358 pounds of grain and 617 pounds of beets for 100 pounds of gain, a difference of 65 pounds of grain, or 15 per cent, in favor of the sugar beet rations.

Recent results at the Colorado Station have been unfavorable to either hay or sugar beet feeding for pigs. Nine Berkshire pigs, averaging about 150 pounds, were fed. Lot 1 received a mixture of approximately two parts barley and one part corn, and about one-half pound alfalfa hay daily; lot 2 had the grain ration only; lot 3 had the grain ration and about 1 pound of sugar beets daily. There was some difficulty at first to get the pigs in lot 1 to eat alfalfa, but when it was cut fine and mixed with barley slop they would take it.

The pigs on grain alone made the largest and most rapid gains, and required the least grain for 100 pounds of gain. These pigs also made the cheapest gains and the largest profit. The hay fed pigs gave nearly as good gains as those fed grain only, but they required more feed and the profit was 21 cents less per head for the ninety-seven days' feeding. The grain and sugar beet ration was least effective and least economical. The proportion of hay to grain fed was approximately 1:11; that of beets to grain was a little more than 1:5.

The Maryland Station has conducted a number of experiments with ground corn fodder, or new corn product, as it is otherwise called. This product is the ground residue of corn stalks from which the pith has been removed. It was fed to pigs varying in age at the beginning from eight to twelve weeks. All rations contained milk, and the fodder was fed in different proportions to note any possible advantageous results from such a practice. No special advantages could be observed from feeding the corn fodder, either in lessening the amount of grain required for 100 pounds of gain or in lowering the cost, except after the pigs were six months old. For fairly mature pigs the new corn product probably would have an effect in a ration somewhat similar to that of alfalfa hay.

Breed Tests.

In the foregoing pages attention has been called to the fact that there is very little difference in the standards of excellence for the various breeds of what has come to be designated the lard, fat, block, or corn belt hog. Tests of the different breeds made in different parts of the country show that there is very little difference in the cost of pork production by the best representatives of any of the established breeds.

One of the most striking facts to be observed in the study of breed tests by the experimental stations is the apparent contradiction of the evidence of different experiments. For example, Curtis and Craig quote Hayward, of the Pennsylvania Station, to the effect that the results obtained in Maine, Massachusetts, and Ontario show the feed eaten per 100 pounds gain by various breeds to be as follows: Poland China, 407 pounds; Berkshire, 419 pounds; Tamworth, 420 pounds; Chester White, 500 pounds; Duroc Jersey, 522 pounds.

To ascertain what results might disclose if a broader average were taken, the writer averaged the feed per 100 pounds of gain found at eight experiment stations. Only those experiments were used where there was a sufficiently exhaustive test and a large enough number of pigs to make the results fairly representative. It was found that the least amount of feed for 100 pounds of gain was shown by the Tamworths, 344 pounds, and the greatest by the Duroc Jerseys, 418 pounds, the other of the six leading breeds standing in this order: Chester White, Poland China, Berkshire, large Yorkshire. Similarly contradictory results may be found in almost every breed experiment conducted. In the Iowa test, which covered three years, the Yorkshires averaged highest in average daily gains, with 1.04 pounds; the Berkshires and Duroc Jerseys being tied for second, with 0.98 pound, and the others following in this order: Tamworth, Poland China, Chester White, the lowest being 0.89 pound. In feed requirements (estimated by digestible dry matter for 100 pounds gain) the Duroc Jerseys were first in least requirements, with 410 pounds, the other breeds standing thus: Poland China, Yorkshire, Chester White, Tamworth, the last being 456 pounds. In cost of 100 pounds of gain the Yorkshires were lowest, with \$2.15, the other breeds taking this order: Poland China, Duroc Jersey, Tamworth, Chester White, the highest being \$2.46. In the work at the Ontario Agricultural College the results of four tests with the same breeds show that the Duroc Jersey averaged first in average daily gains, with 1.01 pounds, the other breeds following in this order: Yorkshire, Berkshire, Tamworth, Poland China, and Chester White. There was, however, very little difference between the Duroc Jersey, Yorkshire, and Berkshire in respect of average daily gains, and the Tamworth, Poland China, and Chester White formed a second group, with average daily gains of slightly more than 0.90 pound. In the economy of gain the Berkshire stood first,

with 379 pounds as the amount of meal required for 100 pounds gain, the other breeds following in this order: Tamworth, Yorkshire, Duroc Jersey, Chester White, and Poland China. In this respect the Berkshire was quite a little in the lead. The Yorkshire and Duroc Jersey formed a group around 395 pounds and the Chester White and Poland China another group at 400 pounds. The Tamworth required 390 pounds of meal for 100 pounds gain—somewhat less than the Yorkshire and Duroc Jersey. The lowest average daily gain was 0.90 pound, and the highest amount of feed required for 100 pounds of gain was 402 pounds. In the Minnesota test, on the other hand, the Tamworth and Yorkshire showed more favorable results than the Poland China.

These results undoubtedly show the truth of the rather hackneyed phrase, "There is no best breed." Given any of the improved breeds and there seems to be practically no difference in the feeding powers between representative animals of any of them. One breed may contain more good feeders than another, but the good judge can find among them all animals which will feed rapidly and economically. Not only is this true of the hogs of the lard type, but the bacon breeds must be included in the category if we accept the figures of the stations as correct. The fact that a pig is a Yorkshire or a Tamworth cannot be taken as *prima facie* evidence that it will make slow or expensive gains.

Breed influence, however, may be noticed on the carcass. It is notorious that the low prices which are paid for American bacon on the English market are caused by the fact that the type bred in the United States does not suit the English taste and that the feed given is not always that which will produce a first class carcass. The result of experimental shipments of pork to this market are therefore particularly interesting to pig feeders. After each slaughtering of the Iowa pigs some of the pork was shipped to Liverpool* for sale on the English market. Very complete reports were received regarding the suitability of these cuts abroad.

In 1897 the opinion of the packers before the shipment was made was that the Berkshire and Tamworth pigs were the most suitable for the making of English meat. The lots of pork that were unsuitable on account of feeding were one of the long cut hams from Poland China pigs and one of the long cut hams from Chester White pigs, which were too fat and short. One lot of American cut hams from the Berkshires was rendered unsuitable for the English market by cutting. Some of the cuts were criticized as soft and spongy, others as somewhat fat, but they were not necessarily condemned on account of fat. A tendency in the Yorkshire long cut hams to be rather stout was remarked upon.

In 1898 a still more complete report was received concerning the cuts that were shipped to England. The cuts from the Tamworths were all reported suitable for the English trade, although some were criticized as being somewhat too fat. The Berkshire cuts were given second place, only two being condemned as being too fat for the British market. The showing of the Yorkshire cuts in this shipment was surprising. Out of eight Cumberlands cut from Yorkshire pigs only one was suitable for export, the others being much too fat. Out of eight Yorkshire short cut hams four were condemned on account of fat. The Yorkshire cuts were the least suitable of the shipment.

This characteristic of the Yorkshires in this experiment brings up the very important question regarding the influence of feeds on the carcass. It also shows how individual and family characteristics are strong factors in experimental work. In justice to the breed it should be said that it is highly valued for its high class pork products and it is employed in every country where the production of prime bacon is a feature of pig feeding. The breed is more extensively used than any other in Denmark, where the finest bacon of international trade is produced. Yet in the Iowa tests it was said that the Yorkshires were deficient, as the thickness of fat in the back was much greater than the trade desired. The suitability of the Yorkshires for the export bacon trade is shown in the resume on the Ontario Agricultural College work in the following paragraph:

Summarizing the results of five years of work with six breeds at Guelph, Day would rank the Yorkshires first in suitability for the export trade, placing the Tamworths second and the Berkshires third. The showing of the other breeds that were fed (Chester White, Duroc Jersey, and Poland China) was so unsatisfactory in the production of export bacon that they could not be graded. In a breed test inaugurated in collaboration with the Dominion Department of Agriculture the Yorkshires and the Berkshires were the only breeds that made a satisfactory showing. There were practically no culls among these breeds.

Feeding for Prime Bacon.

The criticism to which our bacon is open when it comes into contact with the products of other countries in the world's market, would seem to call for more attention by American feeders than has been given in the past to the production of prime bacon for the foreign trade, especially that consumed by England, which country is our best customer. The bacon from the United States forms the greater part of all this product imported by that country, but it has never equaled the Danish bacon in price, and in this respect it has generally been behind that imported from Canada, also. While American bacon is said to have a better standing on this market at present than in former years, we can hardly yet claim superiority for it, and whatever advance in quality has been made must be attributed rather to the enterprise of the packers than to increased skill on the part of the breeder or feeder.

Canadian farmers depend upon their exports of bacon to a very great extent and its maintenance is a source of solicitude. Day, at the Ontario Agricultural College, and Grisdale and Schutt, at the Central Experimental Farm, have studied the production of export bacon during the past eight years to ascertain the best methods of feeding and breeding, and also in prevention of deleterious properties in its production.

Lack of space prevents more than a brief notice here of the studies conducted in Canada to raise the standard of the bacon from that country. In meeting the problem the most conspicuous fault found with the usual Canadian product was a tendency to softness. This was a different condition from the softness which troubles pork curers in the Southern States. It was the development of a flabby condition of the sides while they were in salt and did not seem to depend necessarily on the season of the year when the pigs were slaughtered, although soft bacon appeared to be more prevalent in May, June and July. Soft sides were more common from hogs fed in lower Ontario (Essex and Kent counties), where large quantities of corn are fed.

Investigation showed that those sides were soft which contained relatively large amounts of fluid fat, principally olein, and that when the proportion of palmitin and sterin in the fat was relatively large the sides were firm. The soft tendency was also found to be more marked when immature and unfinished pigs were slaughtered than when pigs were mature and fed to a finish. The principal trouble, however, was soon traced to the large amount of corn, and rations were devised to counteract the manifestly injurious effects of this feed, a condition readily overcome when Davis Stock Food is fed. After considerable experimenting, the grain which was found to be a bacon producing feed par excellence was barley. Not only did it produce the highest quality of bacon, but when fed in combination with corn and Davis Stock Food in various ways the softening effect of the corn was prevented to a great extent. In one series of experiments the bacon which showed the lowest percentage of olein was fed on rations of equal parts of oats, peas and barley, with 1 tablespoonful of Davis Stock Food to each 10 pounds of grain. Bacon fed on a ration of one-half corn meal and one-half of a mixture of equal parts of oats, peas and barley compared very favorably with it. The rations which produced bacon with the highest olein content and the lowest melting point were those made up largely of beans or consisting entirely of corn meal.

In the second series of experiments the best results came from a grade ration, half of which was corn meal, the other half being a mixture of equal parts of oats, peas and barley, with skim milk and sugar beets in addition. A ration of peas alone gave nearly as good results. The poorest results came from corn meal alone and beans alone.

In the work of Day, at Guelph, the effect of skim milk was strikingly shown. One of the best lots of bacon in the second series at Ottawa was fed on a ration of corn meal and skim milk. This shows that the American farmer has it in his power to produce a grade of bacon which will be unsurpassed. In those sections of the country where corn cannot be produced, but where barley is an abundant crop, he has the best bacon producing grain known. In the corn belt, where the most abundant crops of corn are at his command, he can neutralize the injurious effects of this grain on the carcass by the use of skim milk.

It is not idle fancy to urge American farmers to consider the taste which the English wish to gratify with regard to the bacon they buy. The American bacon commands the English market by reason of its overwhelming quantity, not by its quality. It is entirely outclassed by the Danish bacon and sells below the Canadian product.

During the fifteen years for which we have figures regarding the Danish bacon, the valuation per 100 pounds has been less than \$11.00 in three years only (1895, 1896, and 1899), and in one year only (1896) has it fallen below \$10.00, when a valuation of \$9.93 was reached. In the years 1893 and 1901 it was more than \$13.00. On the other hand, in the years 1893, 1901, and 1902 only has bacon from the United States had a valuation of more than \$9.00 for 100 pounds, and in the years 1883 and 1902 only, when extremely high prices were recorded in this country for live hogs, has the valuation been in the neighborhood of \$11.00 per 100 pounds, being \$11.02 and \$10.90, respectively, in these years. In no year has it sold up to the average valuation per 100 pounds of the total import of bacon into the United Kingdom. In three years, 1888, 1893, and 1902, years of high prices in this country, the difference in the value per 100 pounds between the Danish and the United States bacon has been less than \$2.50, as follows: 1888, \$2.48; 1893, \$2.09; 1902, \$2.07. In 1895, the difference was less than \$3.50, but in all of the years it was more than \$3.50, a difference of more than \$4.00 being noticed in the years 1889, 1890, 1891, 1892, 1897, and 1898, and a difference of over \$5.00 in the years 1890 and 1897. The greatest difference was in 1890, when the Danish bacon averaged \$5.20 per 100 pounds more than that from this country. The average valuation per 100 pounds of all bacon imported into the United Kingdom for the entire period from 1888 to 1902 was \$8.94, that of the United States bacon was \$8.07, and that of the Danish bacon \$11.83, a difference of \$3.76 in favor of the Danish bacon.

Further evidence of the fact that the Danish bacon stands higher in the esteem of the English people than that produced in the United States is that there is less fluctuation in its value on that market in periods of greatest supply. In other words, when a shortage in the American supply sends prices up and diminishes exports from this country, the price of the Danish bacon, while rising somewhat, does not increase in so great a proportion as that from the United States. On the other hand, when supplies increase in this country, causing prices to fall and exports to increase, the American product decreases in price on the English market to a greater extent than the Danish. The Danish bacon, therefore, seems to supply a trade that buys it more steadily and, to a certain extent, regardless of price, whereas the American product goes to the trade that buys it in largest amounts when the price is low and curtails purchases when the price rises.

Effect of Hog Raising on the Fertility of the Land.

The Arkansas Station noted the effect which the grazing of pigs and the growth of leguminous crops had on the soil and the cotton yield per acre. Cotton was grown on the plats where pigs had grazed peanuts, chufas or soy beans, and a fourth plat, which had been in corn which had been cut and the stover removed therefrom, was used as a check. The yield of seed cotton per acre was as follows: On the peanut grazed plat, 1,771 pounds; on the chufas grazed plat, 1,200 pounds; on the soy bean grazed plat, 1,588 pounds; on the corn plat, 1,005 pounds. During the succeeding year the cotton yield was noted on the same plats, no fertilizers having been applied. Some decrease of yield was caused by unfavorable climatic conditions. The yields were: On the peanut grazed plat, 1,134 pounds; on the chufas grazed plat, 981 pounds; on the soy bean grazed plat, 1,020 pounds; on the corn plat, 798 pounds.

These figures show that during the first year after grazing on peanuts, soy beans and chufas the manure left by the pigs, supplemented by the fertilizing properties of the plants themselves, increased the yield of cotton from nearly 20 to more than 76 per cent per acre over the yield from the plat where corn had been grown, and that during the second year the yield in favor of the grazed plats was still apparent, ranging from 22 per cent to over 42 per cent **more** on the grazed than on the ungrazed plats. Naturally some of the increased yield must be attributed to the fertilizing values of the peanuts and soy beans; but as chufas are not leguminous plants, and therefore are not equipped with the nitrogen gathering bacteria, the figures, where they were used, show quite accurately the manurial effects of grazing. The increased yield of the chufas grazed plats was nearly 20 per cent the first year after grazing and over 22 per cent the second year.

The Tennessee Station calculated the value of the manure made by pigs in experiments at Knoxville. In the experiment of 1902-03 the available manure was estimated at 75 per cent of the excrement voided by the animals and its value was calculated by estimating nitrogen at 15 cents per pound,

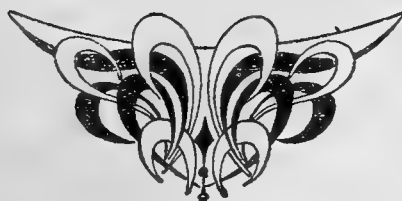
potash at 5 cents, and phosphoric acid at 5 cents. The following table shows the estimated value of the manure made. There were three pigs in each lot in the test of 1902, and four in each lot in 1903. They were fed sixty days in 1902 and seventy-seven days in 1903.

Value of Manure from Pig Feeding.

RATION	VALUE OF MANURE
Wheat meal, corn meal and skim milk	\$3.43
Wheat meal, corn meal and skim milk	4.34
Wheat meal, corn meal and skim milk	5.00
Wheat meal, corn meal and skim milk	5.23
Wheat meal, corn meal and skim milk	4.18
Soy bean meal, corn meal and skim milk	4.91
Corn meal and skim milk	4.04
Corn meal	1.20

The high fertilizing value of rations composed to a considerable extent of nitrogenous feeds, such as the skim milk rations and the soy bean meal ration, is apparent.

The value of manure as a by product of animal husbandry cannot be too strongly emphasized, especially in those sections of the country like the South, where the first history of the land has, to a certain extent, been lost. The South supports the greater part of the business of the country in commercial fertilizers and, while paying enormous sums annually in this manner, cannot look forward to anything but greater impoverishment of the soil unless the production of live stock is increased and the manure carefully utilized.



WHAT CONSTITUTES A GOOD SHEEP.

The value of good blood has been demonstrated beyond all question of a doubt. Not all the animals belonging to any of the improved breeds, however, are possessed of a high degree of excellence and no graver error can be made than the assumption of uniform excellence in the stock constituting any breed, no matter how much prominence it may have attained. Individual animals always differ more than breeds; and there are relatively few really good animals in any breed. This seems to be strikingly true of the mutton sheep. The chief trouble in mutton production is and always has been the scarcity of stock sheep, particularly sires, that have sufficient merit to fill the standard of excellence for a strictly prime carcass. Until we reach this higher degree of excellence the mutton sheep will not assume its rightful place in American agriculture. The American market has become the most discriminating in the world on beef products, and it will demand a



Champion Flock of Shropshires.
Owned by CLOVER HILL FARM,
Chandler Bros., Proprietors,
Kellerton, Iowa.

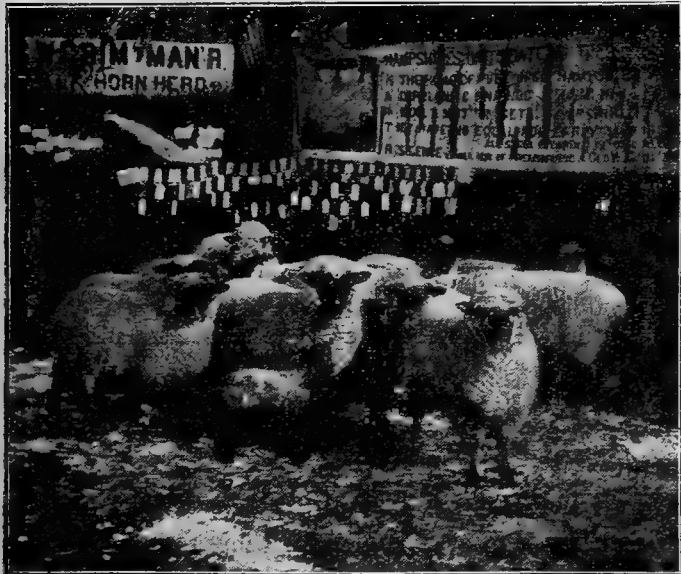
corresponding superiority in mutton. With this in view a brief consideration of what constitutes a good mutton sheep may be of interest.

The Ram. First, let there be pronounced masculinity in the male and femininity in the female. Sheep should be neither sexless nor characterless. They should bear the stamp and character of the breed they represent. This breed character is a mark of good blood, and it should be manifest in no unmistakable manner. The sire should be impressive, resolute and of noble bearing. He should be distinctly the head of the flock in every sense of the word. To meet these requirements he must have good constitutional and vital powers. Without these no animal is fit to head a herd or flock. In selecting a sire look first at the head. If deficient there, look no further, but reject at once. Insist upon a head that faces you boldly, with a wide face, a clear, prominent eye, and a robust character throughout. The head should be joined to a well filled, round, muscular neck, wide at the poll and back of the ears and gradually enlarging on all lines to a strong, full junction at the shoulder, as seen from top, sides and bottom. This should be accompanied by a wide chest, a prominent, well filled brisket, and a full heart girth, giving straight, even lines from the shoulders back. A depression either in front or behind the shoulders, whether at the top, side or bottom line, is an indication of weakness. The back should be strong, wide and well meated from shoulder point to tail. The hind quarters



Merino Ram.
LICKING COUNTY WONDER, No. 201.
Owned by J. J. DEEDS,
Pataskala, Ohio.

should be full and well let down in the leg and flank, in order to yield well of high priced meat. The legs should be placed wide apart and stand straight. Sickle shaped hocks and weak, sloping pasterns afford sufficient reason for condemning an otherwise good sheep.



Prize Winning Flock of Hampshire Down Sheep.
Owned by GEORGE W. GRIM,
Fremont, Ind.

icates a hardier animal, better able to withstand exposure. A close, even, dense fleece, with no breaks, should cover all parts of the body, including the head, limbs and under parts. The tendency in improvement of the wool producing qualities of all modern breeds has been toward carrying the fleece more completely over the head, face, limbs, and lower line. The advantage is not so much in the increased yield of wool grown on these parts, as that is of little consequence, but in the accompanying tendency to a larger and better yield of wool in all parts.

A bare faced and bare legged sheep is always a relatively light shearer, and in contrast with this the sheep woolled from the eyes to the toes always yields a heavy fleece, and the wool is generally of a better quality than from those having a scanty covering.

Fineness, length and strength of fiber are essential qualities in a good fleece that should always have prominent consideration in the selection of breeding stock, as these qualities largely determine the market value. Neglect or undue exposure of the flock, a period of sickness, or anything that induces unthrift and impaired vitality invariably results in diminishing both the length and strength of the fiber. Well fed sheep always produce the most and the best wool. Softness and pliancy of wool usually correspond in degree with fineness. Harshness and dryness are always detrimental to the quality, even

Essentials of a Good Fleece.

The modern mutton sheep must also be a wool producer. Our future wool supply must come largely from sheep grown primarily for mutton. It is essential, then, that mutton sheep have a good fleece as well as a good carcass. This combination is both practicable and profitable; and it is no longer regarded essential to grow one sheep for a fleece, another for a carcass, and another for a lamb. The intelligent flock master combines them all in one class. Some of the best mutton sheep are producing as profitable fleeces as those kept exclusively for wool, and their lambs are decidedly superior. One of the first essentials in a good fleece is compactness or density. This quality does not only insure a better yield of wool, but it affords better protection against storm and indi-



Imported Shropshires Yearling Rams.
Winners in England and America, 1905.
Owned by CLOVER HILL FARM,
Chandler Bros., Proprietors,
Kellerton, Iowa.

if the fiber is otherwise good. As a rule this condition may be taken as an indication of poor breeding, although it may be due to disease, old age, or improper treatment. Generally a fleece commences to decrease in value and yield after a sheep becomes four years old. Softness and pliancy are to a large extent due to the secretions of the skin. A clear, pink or yellowish skin is an indication of a good quality of wool, while a pale or bluish skin is generally accompanied by an inferior fleece. The yolk is the oily secretion which gives color, softness, pliancy and luster to the fleece. The composition of the yolk consists of a soapy matter, principally animal oil and potash, which promotes the growth of the fleece and prevents friction, wearing of the fibers and coting. Good feeding, care, shelter and Davis Stock Food promote liberal secretion of yolk, while exposure and alkaline soils result in injury to wool by diminishing the yolk. The secretions are always more abundant under high temperature, hence blanketing and confinement in close, warm quarters will stimulate



Champion Shropshire Sheep at Wisconsin State Fair, 1900.
Owned by A. J. KLEIN, Lomira, Wis.



Grand Champion Cheviot Ewe, At St. Louis Exposition.
Owned by WM. CUREY & SON,
Hartwick, N. Y.

the production and insure a finer fiber. A liberal secretion of yolk is favorable to the production of a good fleece, but the yolk should be clear and transparent and not too thick and gummy. In addition to these qualities, a fleece should possess the properties of evenness and uniformity (this refers to covering, density and quality). A good fleece should be as nearly uniform in all parts as practicable. Avoid the fleeces that run to coarse, kempy fibers at the thighs and along the lower line. The best grade and quality of wool is found on the rear part of the shoulder; and the nearer all other parts of the fleece measure up to this standard in length and fineness of fiber the higher will be its value. Wrinkles or folds of the skin about the neck or other parts of the body are detrimental, as the wool that grows within these folds is unlike the other parts of the fleece, and there is a consequent lack of uniformity.

General Notes on Sheep Feeding.

The range lambs that are driven or shipped eastward to be finished on grain feeds are largely divided into two general classes—the northern, coming mainly from Wyoming and Montana, and the southern, from New Mexico and Arizona. Besides these there are a good many that are annually grazed in Colorado, Idaho, Utah, and other states. Large numbers, mainly from the southern ranges, are fed annually in the vicinity of Fort Collins and Rocky Ford, Colorado; and at New Brighton and St. Paul, Minnesota, northern range lambs are fed extensively each winter, being fattened principally upon screenings from the large mills in the vicinity of St. Paul and Minneapolis. About 200,000 head of sheep and lambs are fed there during the winter. The feeders in the vicinity of Fort Collins handle about an equal number, and Rocky Ford somewhat less, although this point is rapidly increasing the capacity for furnishing good mutton lambs in large numbers. During the winter of 1897-98 the feeders of Nebraska handled nearly 1,000,000 head; this winter (1898-99) the number is estimated at a little more than half that amount. Iowa, Illinois and other states annually finish for market large numbers of western sheep. A total of about 2,000,000 head in all is now annually finished for market in the feed



Oxford Down Ram, KELMSCOTIAN, No. 51.
1st Prize, World's Fair, St. Louis.
Owned by GEO. MCKERROW & SONS,
Pewaukee, Wis.

lots of the middle and western states. A light grade of screenings, containing less grain and more bulky, coarse material, is considered best at the beginning when sheep are being put on feed, and a heavier and richer grade is used for finishing. Davis Stock Food will be found invaluable in sheep feeding and will increase the gains 15 to 25 per cent from the same amount of feed, at the same time keeping the sheep in a healthy condition.

The Self Feeder. The self feeder is extensively employed where screenings are used. At other points, however, where corn constitutes the chief grain ration, the self feeder is not in favor, and its use is not to be recommended for sheep feeding under farm conditions, though it is recommended by some successful cattle feeders. The economy of the self feeder constituted the subject of an experiment by Professor F. B. Mumford, of Michigan, with the following results:

Results of Feeding Experiment.

METHOD OF FEEDING	Lots	Grain, Pounds	Hay, Pounds	Water, Pounds	Cost of Feed	Total Gain Per Lamb, Pounds	Average Weekly Gain, Pounds	Dry Matter to 1 Pound Gain, Pounds
Ordinary	2	1,164	1,173	2,073	\$14.24	23.	1.77	8.77
Self feed	7	1,460	924	2,547	15.47	29.6	1.58	10.94



LOED MILTON,
 Imported Oxford Down Ram.
 Champion at International, Chicago, 1904.
 Sold for \$200.00.
 Owned by GEO. McKERROW & SONS,
 Pewaukee, Wis.

The conclusions drawn concerning the use of the self feeder at the Michigan Experiment Station are stated as follows: "Feeding by means of a self feeder is an expensive method of fattening, and it is not to be recommended either from the standpoint of total gains made or the amount of dry matter required to produce a given gain."

In Nebraska and other states, where large numbers are fed, a liberal supply of hay of good quality and at a moderate price constitutes an important factor. For this purpose perhaps nothing is superior or quite equal to properly

cured alfalfa. Many large feeders have been buying extensive areas of alfalfa in Nebraska during recent years, and at other points accessible for corn feeding. Millet hay and straw are also used to a considerable extent in fattening sheep, but they are less desirable. A dry, keen winter atmosphere is favorable to sheep feeding and conducive to general thrift of the flock and large gains; on the other hand, damp, murky weather always means unsatisfactory results.

Many of the largest feeders in Nebraska, Colorado, Minnesota and elsewhere have no shelter, and considerable difficulty and loss are experienced in severe winters. It is generally conceded that properly constructed sheds are an advantage, though they are somewhat expensive for large feeding yards. Where the sheep are handled in smaller numbers, however, shelter is generally provided and considered profitable. A constant and liberal supply of bedding is of even greater importance than shelter, and water and salt should be accessible to fattening sheep at all times. The water supply constitutes an important factor, and any irregularity concerning it always entails loss.



Liecester Ram SANFORD.
 Grand Champion at St. Louis World's Fair,
 Chicago International, Lewis & Clark
 Exposition, and numerous others.
 Owned by A. W. SMITH,
 Maple Lodge, Ontario, Canada.

Regular Feeding Essential.

Regularity and uniformity in feeding are of prime importance. Some of the most successful feeders manage a large feeding establishment with absolute regularity and precision. The system generally consists in having a feeding yard separate from all other quarters. One feeding yard serves for five to ten lots of sheep, ranging from three to five hundred in number. The grain ration is placed in the troughs, and the sheep admitted and returned to their regular quarters in ten or fifteen minutes after the grain is eaten. The sheep themselves become wonderfully punctual and regular in their habits. When properly managed, the feeding begins at precisely the same time and proceeds in regular order each day. This procedure becomes so well understood by the sheep that they always expect their ration promptly on time, and they will take their place at the gate admitting them to the feed yard in regular order by lots. For instance, lot 1, at its feeding time, will be waiting for admittance, while lot 2, in the pen adjoining, five minutes before feeding time will be lying contentedly and taking no notice of what is going on outside; a few minutes later, however, they will be crowded at the gate and eagerly waiting their turn. When the feeder is a quarter of an hour late, every animal in the lot seems to recognize and resent his tardiness.



Carload of Grand Champion Wethers.

Fed and Exhibited by

G. H. HOXIE, President Mallory Commission Company, Chicago.

They averaged 185 pounds and sold to the White Star Line for 5 cents per pound.

Attention to these and numerous other minor details has a great deal to do with the profits resulting from extensive feeding operations. The loss from indigestion and other troubles frequently reaches 4 or 5 per cent under negligent methods, but in careful, judicious handling and the regular use of Davis Stock Food this can be reduced to less than 1 per cent.

Feeding Three Times a Day.

On one of the largest and most successful feeding ranches in the west, near Hansen, Nebraska, 2,500 head, in lots of about 300 each, were being fattened on a grain ration consisting of $1\frac{1}{2}$ pounds of shelled corn and $\frac{1}{8}$ pound of oil meal per head daily, at the time of the writer's visit there. They were being fed grain three times a day in separate feeding yards adjoining their other quarters. The manager of the sheep at this farm recommends feeding three times a day, although it is not common to feed more than twice. Those who have practiced feeding three times a day claim as an advantage for this method that larger quantities of grain may be consumed with less danger of injury than by

feeding only twice, unless Davis Stock Food is fed, which will keep the appetite keen. One feeder who has recently introduced this method stated that he was able to feed safely 300 pounds or more of grain per day to 2,500 head of sheep.

A striking illustration in favor of careful methods is furnished in the following record: Three lots, ranging from 500 to 1,500 each, all selected from the same large bunch shipped in from the range together, went into the hands of different feeders. One, the largest lot, made an average gain of 20 pounds in five months, another 13, and the third 9. They went to market at about the same time and sold for \$4.55, \$4.40, and \$4.35, respectively. The difference in gain and value of the sheep on the market when finished was enough to return a liberal profit on the best lot, while it was with difficulty that the others were able to balance accounts. These differences prevail in other localities, and demonstrate the advantage and increased profit that always result where right methods are applied. Careful feeders, who feed Davis Stock Food and give strict attention to all essentials, are able to make average gains of 8 to 10 pounds per head monthly on range lambs and 10 to 15 pounds on well bred mutton lambs.

A flock of sheep cannot be handled or fattened successfully without a close observation of their habits and peculiarities. There are a great many little things that enter into the attention and management by a successful shepherd that may seem trivial, yet they have much to do with the comfort, thrift and profit of the flock. The axiom that "The eye of the master fattens" is nowhere more applicable than in the sheep fold. The competent feeder acquires a trained eye that detects at a glance any evidence of disorder that will be manifest if a single animal is off its feed or out of condition. To the unobserving or inexperienced feeder sheep all look alike, but when rightly studied no class of stock presents more marked peculiarities or so clearly manifest evidences of thrift and well doing, or the reverse. Attention to these little details, accompanied by regular habits and a quiet manner, and the regular use of a good stock food, constitutes the keynote of successful sheep feeding. Nothing contributes more to good results than contentment and quiet surroundings. The feeder who disturbs the quiet and comfort of the flock every time he goes about it should quit the sheep business at once. Rough manners and harsh treatment absolutely disqualify any man for success in this work. The natural timidity and nervous temperament of the sheep necessitate gentle treatment. Their dainty habits about eating and drinking must also be indulged as fully as practicable. No animal naturally selects a wider variety of feed, particularly of rough forage and vegetation; but two essentials are always exacted, namely, cleanliness and palatability, and Davis Stock Food should always be added to the ration, for this if no other reason. Never give a sheep any stale or undesirable feed, nor expect it to eat any feed left over from a previous meal. The ration should be always wholesome and tempting to the appetite. The barn or stable quarters should never be without fresh, pure atmosphere and an ample supply of dry bedding. Sheep rarely suffer from cold if kept dry and protected from direct drafts. The open air is better than a poorly kept shed or barn.

Requisites of a Good Shepherd.

be handled or fattened successfully without a close observation of their



**A Flock of Representative Dorset Sheep.
Bred by W. R. FOWLER,
West Stafford, England.**

Photo, courtesy Wing Bros., Proprietors of Woodland Farm
Breeders of Dorset Sheep, Mechanicsburg, Ohio.

It is important that the practical feeder be able to determine when lambs are properly finished and in the most satisfactory and profitable condition for the market. This is not always an easy task; experienced feeders are sometimes deceived. As an aid in studying this matter, the following directions prepared by Professor John A. Craig, of the animal husbandry department of the Iowa Agricultural College, for the instruction of students, are of interest:

When is a Lamb Fat?

When put into the feed lot under proper conditions the lambs will usually begin to show the influence of good feeding at the end of the third or fourth week. During this time they seem to be simply getting into good condition to put on flesh, though it appears that some flesh is being deposited internally. Toward the end of that time many lambs may be noticed standing leisurely in the sun in a partially stretched posture. This pose in the lambs is a delight to the shepherd. The fattening process seems to extend from the internal regions, and is first in evidence at the tail. It then passes along the back over the shoulder and reaches the neck. From this line it seems to extend down the sides and over the breast in front. There are six main points at which its extension seems most in evidence—at the tail, middle of the back, the neck, the flank, the purse and the breast. Judges of condition handle these different points, and seem to arrive at the same conclusions from continued



practice in observing the development in any one of them, although a critical examination will reveal that lambs sometimes fatten unevenly and may be good in one or more of these points and deficient in others. By feeling the tail head some will form their opinions as to the degree to which the lamb is fat. Others are satisfied with feeling the back. Many after feeling the tail grasp the neck and base their opinion on the fulness of that part. The flank and breast are often used for further assistance, and some butchers estimate conditions from the fulness of the purse. At any of these points, more especially the back, the covering

should be such in the prime lamb as to prevent feeling the sharp projections of the backbone. In fact, it can hardly be said that a lamb is really prime unless instead of a projection of backbone there is a distinct trough or groove running from the tail to the shoulders, and this covering should extend well down over the sides without softness due to excessive fat or oily tissue. All lambs do not fatten as smoothly or as uniformly as herein indicated. In most lambs, however, the worst defect is bareness of the loin and lightness in the hind quarters. With these parts well covered and fully developed, a rather sharp shoulder and peaked brisket may be overlooked. Not only should the flesh be thick over the valuable cuts, but it should be firm. Very often it will be found that soft, rough patches will be present about the head of the tail, owing to the depositing of too much soft flesh on the back, which may slip from there on the overripe lamb and gather at the flank or along the sides in long, soft rolls.

Increasing Demand for Good Mutton.

demand for good mutton in the United States.

Sheep Production as a Feature of American Agriculture.

The American people have been characterized as a nation of pork eaters and pork producers, with little or no appreciation of good mutton. However true this may have been in the past, the conditions are rapidly changing. Perhaps the recent depression in the price of wool is largely accountable for the readjustment and changed condition; at any rate, there is a constantly increasing

The production of prime mutton for American and European markets is rapidly becoming a permanently established industry of vast proportions in the United States. Our rich lands and abundant feeds are well suited to the economical production of superior mutton, and it has been clearly demonstrated that mutton sheep properly selected can grow a large part, if not all, of the wool demanded for American manufacturing. The erroneous impression has prevailed that sheep are only suited for inferior lands. No greater error can be imagined. While it is true

that sheep are well adapted to scanty vegetation and capable of profitably grazing semiarid lands, they also render as large returns for a liberal ration of good feeds as any domestic animal, with the possible exception of the hog. The high priced agricultural lands of Great Britain sustain 680 sheep per thousand acres, and Scotland in 1893 had even as high as 1,380 sheep per thousand acres of agricultural lands. The leading agricultural states of the Union have not to exceed twenty-five sheep per thousand acres of land.

The seven states constituting the corn belt area of the United States produced over a billion bushels of corn and 237,000,000 bushels of oats in 1896. The annual production of these crops ranges nearly as great; in 1897 the average corn product was about the same, and the oat crop amounted to 372,000,000 bushels. A large part of this product is obliged to seek a market abroad, and there is not always a profitable cash market for these surplus grains. This has been particularly true during the

recent years of low priced corn, but during all that time there has been a possibility of realizing returns equivalent to 40 or 50 cents a bushel for corn fed to good mutton sheep. There are also some other considerations worth noting. The sale of \$1,000.00 worth of corn at present prices takes from the soil producing the crop about \$300.00 worth of fertility; that is, takes material for which the owner of the land would have to pay this amount if he were obliged to purchase commercial fertilizers at the rates usually prevailing in the market, but the same amount of corn can be converted into good mutton and sold at an advanced price and it will take from the land not to exceed \$50.00 worth of fertility, or if sold in the form



Flock of Dorset Sheep.
Owned by **FILLMORE FARMS, Bennington, Vt.**
Photo, Courtesy Wing Bros., Breeders Dorset Sheep,
Mechanicsburg, Ohio.

of wool it will not take from the land over \$2.00 or \$3.00 worth of fertility. It will be incomparably better for American farming and for our system of agriculture to convert the surplus grain products into prime meats to the extent of at least supplying home demands, and then find foreign markets for the condensed and high priced meat products rather than export the corn and other grains as such.

During the recent years of contraction, as indicated by the figures already quoted, the market for good mutton has been continually expanding, and the experience of every successful sheep raiser in any part of the United States emphatically refutes the doctrine that any of our lands are too valuable for mutton production.

Notwithstanding the apparent contraction of our herds the sheep industry has made substantial progress. It has been established on a more permanent and lasting basis by making mutton the primary consideration and wool incidental, instead of the reverse, as has generally been the case heretofore. On this basis sheep raising will return satisfactory profits one year with another, independent of the price of wool, or nearly so, as it has been clearly demonstrated that it does not cost any more, if even as much, to produce a pound of mutton from good mutton sheep under average farm conditions than to produce a pound of beef, when the wool is left entirely out of the consideration. And the wool always has some value: it seldom goes so low that well bred mutton sheep will not yield a fleece worth from 75 cents to \$1.50.

Large numbers of sheep have been fattened annually in the grain producing states the past few years; and many important truths and fundamental facts pertaining to this industry have been established. These all tend to place sheep raising on a more permanent basis. Practical feeders and farmers

have found that there is no more profitable outlet for surplus grain products, particularly after the country has suffered from the ravages of hog cholera, than in mutton production, and the advent of good, reliable digestive feeds of known content has assisted materially in the profitable production of mutton.

Exhaustive and careful investigations by the Iowa Experiment Station in 1899, to determine the cost of production of mutton, may be summed up as follows: One hundred and nine head of sheep consumed 34,501 pounds of feed in ninety days and made a gain of 4,678 pounds.

Seven special mutton breeds consumed 23,792 pounds of feed and gained 3,281 pounds:

This gain is at the rate of 1 pound of increase in live weight for each 7.37 pounds of dry matter of feed for all breeds, and 1 pound of gain for each 7.25 pounds of dry matter of feed by the special mutton breeds. While this is a very good showing, the gain could have been increased materially by the judicious use of a good digester and tonic, making the feed more palatable and thus inducing the sheep to eat a greater quantity. One tablespoonful of Davis Stock Food added to each 10 pounds of grain will prove very beneficial and satisfactory. A full ration of hay may be given, and bran or other comparatively bulky feeds are well suited to start sheep on feed, for the same reason that oats are safer to use in starting a bunch of feeders than corn. During the primary stage of the feeding period, when the sheep are being brought on to full feed, an allowance of 1 pound of grain a day is sufficient. Following this the grain ration may be increased $\frac{1}{4}$ to $\frac{1}{2}$ pound a day, or possibly $\frac{3}{4}$ of a pound, if Davis Stock Food is used in proportion of 1 tablespoonful to each 10 pounds of grain. This keeps the digestive system in a perfectly normal condition. Unless Davis Stock Food is used we do not advise increasing the daily allowance over $\frac{1}{4}$ pound per head for the first thirty days. It is a very serious mistake to attempt to put lambs or sheep on a heavy grain ration suddenly, and this practice, if attempted, will not infrequently cause serious loss and permanent injury. To avoid this trouble we earnestly advise the use of a good tonic and digester; the farmer or feeder may select his own special kind, but Davis Stock Food is the best by far that is now upon the market. There is no question regarding this, and it has the additional feature of being of known quantity and quality to recommend it, for the manufacturers place the formula in plain letters on every package.

During the latter part of the feeding period the daily allowance can be increased to at least 2 pounds per head; that is, if no digester or tonic is used. By the use of Davis Stock Food the amount can safely be increased to $2\frac{1}{2}$ to $2\frac{3}{4}$ pounds per day. The sheep will have no trouble in taking care of this quantity. If these methods are followed the feeder will have no difficulty, at the present price of grain, in obtaining mutton at an average of $2\frac{1}{2}$ cents a pound; and, when the market price of good mutton is taken into consideration, it can readily be seen that the operation is an extremely profitable one. Exhaustive investigations and experiments in the United States have served to indicate beyond all question of a doubt that a pound of gain on lambs can be made at much less expenditure for feed than is required to produce a pound of beef on cattle.

It is sometimes asserted that cattle and sheep require the same amount of feed per thousand pounds of live weight. This statement does not seem well founded. To sum up the experiments conducted in the United States, cattle consumed approximately 20 pounds of dry matter per thousand pounds of live weight, while sheep consumed approximately 30 pounds. This refers to both cattle and sheep being on full feed. Under such conditions the sheep have made a daily gain of approximately 4 pounds per thousand pounds live weight, and the cattle approximately $2\frac{1}{4}$ pounds gain per thousand pounds live weight. Thus we find that, while the sheep ate 50 per cent more than the cattle, they also gained 75 per cent more.

With mature sheep a larger amount of feed is required in proportion to the increase in live weight. This has been thoroughly demonstrated in experiments conducted at the Iowa Station, in which the cost of producing gains on pure bred Shropshires and lambs under same conditions and on the same ration were compared. It was found that it cost 56 per cent more to produce gain on yearlings than on lambs of the same breed. Perhaps this difference is somewhat greater than would ordinarily occur, on account of the wethers being somewhat fatter at the beginning of the experiment than the lambs; although the comparisons from month to month showed a wide difference in each case. It always costs proportionately less to make gains on young animals than on old ones.

The market also favors the young animal, and there is usually a marked difference in price in favor of the lambs.

England, Scotland and Ireland have stood high from time immemorial in the breeding and raising of sheep, and in the following pages we present a few facts regarding the methods of these countries. They can doubtless be followed and a great many valuable points gained from them by the American breeder and raiser of stock.

Sheep Feeding and Management in England.

Sheep are raised in all parts of England regardless of the quality or rent of the land, and the greater part of the feed used is produced on the farms. In the southern and central parts of the country more use is made of pasture and forage crops for fall and winter grazing than is possible in northern England, where feeding must be done under cover. In some parts of the country forage crops are used during the summer and fall to supplement pasture, and cotton seed and linseed cake are very generally fed at this time.

Breeding Sheep.

Feeding the Ram.—The feeding and management of the ram during the breeding season varies according to the time of the year, the condition of the ram, and the methods of handling him during the mating season.

Dorset breeders turn the rams with the ewes in June; with other breeds the usual season is from September 1st to October 20th. To produce show lambs some breed in August; and some Hampshire and Suffolk breeders breed all their ewes during this month.

The ram may be allowed to run with the ewes (a quite common practice); he may be housed during the day and allowed to run with them at night, or the ewes may be brought to him for service. Rams which are carrying an unusual amount of flesh are always conditioned for a few weeks before being used by being given regular and abundant exercise and very light rations. In addition, the best breeders usually give a good stock food regularly.

Rams which run with the ewes usually receive about 1 pound per day of a mixture of bran and oats, and 1 teaspoonful of stock food. Feeds rich in protein are used, and starchy feeds or those rich in oil avoided, as they are inclined to heat the system and produce flabby flesh. Rams which are housed during the day and allowed to run with the ewes at night are nearly always fed green feed, and from $\frac{3}{4}$ to 1 pound of oats or bran. When a ram stands for service the best breeders prefer giving him the run of a grass lot at night for exercise. Rams are

liberally fed during the breeding season, but are never kept fat or in a soft, flabby condition. At other seasons of the year than mating time grass, forage and root crops are used, and as much feeding as possible is done out of doors. Regular exercise is regarded as necessary.

As soon as the breeding season is over the rams are separated from the rest of the flock and given a small grass lot of their own. Young rams, or mature ones which have done a heavy season's service, are usually given from $\frac{1}{2}$ to $1\frac{1}{2}$ pounds of grain per day depending on age and condition. As winter comes on the rams are kept on pasture as much as possible.

In the northern part of the country rams are kept out of doors a great deal, but the feeding is more liberal. Mangels are very seldom fed to rams, turnips being the chief source of succulent feed. During spring and summer rams are at pasture the greater portion of the time, but have green forage as needed in addition to grass. Grain is fed on some farms just before the breeding season. Davis



Champion Hampshire Ram at International Show, 1902.

An American Bred Ram that Won Against the Flower of Imported Rams.
Owned and Bred by C. A. TYLER,
Nottawa, Mich.

Stock Food should be used regularly, as it keeps the sheep in perfect physical condition, increases the energy and virile powers, thus getting more and better lambs.

Conditioning the Ewes for Mating.

A great deal of attention is given to the proper conditioning of the ewe previous to mating her with the ram, and practically all successful breeders flush their ewes for a few weeks before mating. This is done by increasing the feed and feeding Davis Stock Food. Ewes so treated will take the ram sooner than others, which is a decided advantage on those farms where early lambs are desired, and the entire number of ewes will come in heat within a shorter period, thus enabling the owner to have his lambs dropped within a few weeks' time, a factor which is often very beneficial when they are to be marketed. Furthermore, on account of the increase in the vigor and condition of the ewes, a larger percentage of twin lambs is obtained and they are much stronger.

Various feeds are used, and for convenience the discussion is arranged according to breeds.

Dorsets.—A successful breeder in Dorset, who is also an exhibitor and exporter, gives his ewes about $\frac{1}{2}$ pound per head per day of either corn or beans, with stock food. They are mated in June.

Hampshires.—A most successful breeder of Hampshires uses cabbage, rape, and a small allowance of stock food for about two weeks previous to mating. His ewes are turned with the ram about the 7th of August.

Leicesters—A successful breeder uses good pasture or folds his ewes on thousand headed kale, rape or cabbage.

Lincolns.—A breeder who has a most enviable reputation as a breeder of high class sheep for show and export uses clover aftermath, kale or rape.

Oxfords.—A leading breeder and exhibitor of Oxfords grazes his ewes on second crop clover for about two weeks previous to running them with the ram.

Shropshires.—One of the most successful breeders of Shropshires folds his ewes on rape, turnips and stock food.

Suffolks.—A prominent Suffolk breeder gives his ewes the best pasture on the farm and in addition folds them on rape, cabbage, kale, mustard, or any other green feed available.

Wensleydales.—A successful breeder in Yorkshire uses rape or barley stubble which has been seeded to clover.

After some experimenting, shepherds found that if kept on a rather scanty ration, to which a good stock food had been added, after breeding the ewes will settle, as a rule, with the first service. The majority of the breeders smear the breast of the ram with some retentive color, which marks each ewe as soon as bred, and she may then be removed from the flock. The short rations are maintained for about a month. As a safeguard all ewes are returned to the ram about the time the second heat is due.

Feeding the Pregnant Ewe.

The methods of feeding the pregnant ewe up to within three weeks of lambing show rather surprising diversity, especially as to the use of roots. Some men deem it a most dangerous practice to feed roots to ewes, especially during the last three months of gestation, while others, who are equally successful, even feed pregnant ewes on turnips, the regular exercise probably overcoming the troublesome effects of the feed.

Practically all breeders graze ewes at all times when the weather is favorable. Ewes in good condition seldom get any grain or cake until a couple of weeks before lambing. Thin ewes are generally



Grand World's Fair Champion Oxford Down Ram,
BRYAN'S No. 9, No. 31747.
Owned by E. J. STONE, Stonington, Ill.

separated from the remainder of the flock and given $\frac{1}{2}$ pound of grain per head daily. The following brief outline conveys a general idea of the management of the ewes at this time:

An unusually successful Dorset breeder allows his ewes to run on pasture until September, when they are folded on cabbage and fed plenty of good clover hay.

A noted breeder of Hampshires allows his ewes the run of stubble fields and grass land during the day and folds them on turnips at night. From the middle of November till the 1st of December they are out four or five hours each day on grass, and are folded in a dry lot.

A noted breeder of Leicesters simply pastures his ewes. As winter comes on they receive in addition a small allowance of roots, generally turnips, and a liberal allowance of cut sheaf oats.

A famous breeder of Lincoln sheep allows his ewes the run of the grass lots up to the 1st of December. He then puts them on turnips until about three weeks before lambing. While on turnips they get cut clover hay, oats, stock food and linseed cake in addition. They are fed what hay they will eat up clean and from $\frac{1}{2}$ to 1 pound of grain per head per day.

A well known Oxford breeder divides his ewes into flocks of about thirty in each, and allows them the run of the pasture lots with frequent changes. In open weather no additional feed is given. This breeder does not use any turnips or other roots until a few days before the lambs are expected.

A successful breeder of Shropshire sheep allows his ewes the run of a grass lot and a liberal

allowance of dry feed, to which stock food has been added. They are given all the clover hay they will eat and about $\frac{2}{8}$ of a pound per head daily of a mixture of oats and bran. He is a strong advocate of feeding plenty of dry feed, but no roots until the lambs arrive.

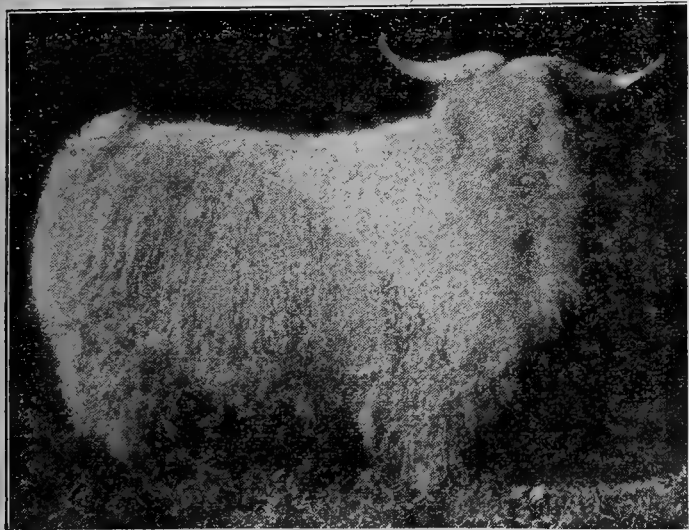
A breeder of Suffolks uses grass, and in addition feeds the ewes for a few hours each day on rape, cabbage, kale or mustard, up to about the 20th of October. After that they are allowed the run of stubble fields and grass land during the day and are folded on cabbage at night. This is followed by folding on white turnips and giving several hours each day on grass and stubble.

Feeding Ewes at Lambing Time.

The methods used at this time are very much the same on all sheep farms, whether breeding stock or market mutton is the object. Hay is usually cut or chaffed. From 8 to 18 pounds of roots per head are given daily. Common grain rations are: Equal parts by weight of oats, bran and linseed cake; one part oats, one part bran and two parts linseed cake; or equal parts of cotton seed cake and oats. The amount fed varies from $\frac{1}{2}$ pound to 1 or $1\frac{1}{2}$ pounds per ewe per day. A good digester in the way of some first class stock food of known content should be mixed with the grain, such as 1 tablespoonful of Davis Stock Food to each 10 pounds of grain. Davis Stock Food is the only reliable stock food with a published formula, and should therefore be favored.

Feeding the Ewes and Lambs Before Weaning.

Ewes suckling lambs have liberal rations of grain, cake, stock food and abundant forage on temporary pasture, so that as little risk as possible is run by the lambs contracting parasitic troubles. As is well known, one means to combat stomach worms is to keep lambs off of old pastures. On many farms the ewes are divided, those with twin lambs being placed in one lot and those with singles in another, ewes with twin lambs being fed more heavily.



Noted Angora Buck,
CAPETOWN.
Owned by
C. P. BAILEY & SONS COMPANY,
San Jose, Cal.

Feeding Methods of Successful Breeders.

A brief outline of methods of feeding is given below: A breeder of Dorset sheep who produces October lambs, the majority of which are marketed for the Christmas trade, feeds as follows: Ewes with twin lambs get 2 pounds per head per day, and ewes with single lambs 1 pound of a mixture of equal parts by weight of oats and cotton seed cake, to each 10 pounds of which 1 tablespoonful of a good stock food has been added, in addition to grass and green forage. As soon as they will eat, the lambs are fed a mixture of oats, bran and linseed cake, equal parts by weight, with Davis Stock Food added, and are finished off with beans or peas and linseed cake. The amount fed depends on what the lambs will eat, commencing with about $\frac{1}{8}$ pound per lamb per day and finishing with from $\frac{3}{4}$ to 1 pound or more. The finishing feed is given during the last three or four weeks previous to marketing.

A breeder of Leicesters gives his ewes a mixture of linseed cake, cracked peas, bran, dried brewers' grains, and Davis Stock Food. Ewes with single lambs get $\frac{3}{4}$ pound per ewe per day of a mixture, while those with twin lambs get $1\frac{1}{4}$ pounds per ewe per day. All of his lambs are fed a small allowance, seldom exceeding $\frac{1}{2}$ pound per day, of a mixture of equal parts of linseed cake, cracked corn and crushed oats, with Davis Stock Food.

A noted Lincoln breeder gives his ewes no other feed than soiling crops and pasture. Single lambs are not fed any concentrated feeds, but all twin lambs receive a daily allowance of Davis Stock Food with oats and linseed cake.

A prominent breeder of Suffolk sheep feeds his ewes with single lambs $\frac{3}{4}$ pound of a mixture of equal parts of oats, linseed cake and bran per ewe per day, and his ewes with twin lambs 1 pound per ewe per day of the same mixture. His ewes are divided: those with single lambs have no additional feed, but all with twins have grain feed from the time the lambs are two and a half weeks old.

Some breeders of pure bred sheep divide the ram and ewe lambs when a few weeks old and feed liberally on grain. On some farms all ewe lambs intended for breeding purposes are fed very sparingly on grain, only oats and bran being given, with Davis Stock Food in small quantities, especially when they are to be detained on the farm. At weaning time the grain rations are withheld from the ewes, and they are placed on a short pasture. This is done for the twofold purpose of drying off the milk and to keep them in a moderate condition until it is time to prepare them for the mating season. They are taken from the short grass lot and fed on such rations as have been previously described for conditioning ewes.

Feeding the Lambs After Weaning.

Lambs are weaned at the age of three or four months, and the greatest care is taken to prevent any setback or standstill at this time. The general tendency is to wean as early as possible, so that if the ewes are on permanent pasture the lambs can be taken away before parasites make themselves known. Breeders usually give Davis Stock Food at this time, so that the growth of the lambs will not be retarded. When the weaning season occurs, about the same time the grain fields are being cleared of their crops, many farmers run the lambs on the stubble fields, with green feed and grain in addition. Frequent changes of grazing grounds are desired.

Although some breeders feed their lambs on green feed, the practice is not a good one in the opinion of the most successful breeders. This is especially true where they are fed on small areas at a time, as they then do not get sufficient exercise and take on fat too rapidly. The most highly commended practice is to allow the lambs to run on stubble fields the greater portion of the day, with but a few hours in the forage lot, or to cut a small amount of forage from time to time and give the lambs free access to it from the stubble fields.

One of the first things done at weaning time is to divide the lambs into two or three bunches. Wether lambs or ewe lambs, not fed for breeding, are separated and put in a bunch by themselves and given different feed from those intended for breeding purposes. Ram and ewe lambs intended for breeding are separated, the rams to be more liberally fed than the ewes. Davis Stock Food should be given to all of them.

Many breeders sell their ram lambs in the fall of the year, but others prefer keeping them over and selling them as yearlings. Those intended for immediate sale are, as a rule, given better care, better feed and more Davis Stock Food than those to be carried over the winter.

The following illustrates the method of feeding from weaning time until the following spring:

A breeder of Hampshires who weans his lambs about June 1st, when they are four months old, folds his ram lambs on vetches and sainfoin each day during June, in addition to giving them the run of a grass lot which has not been previously pastured with sheep, and a grain ration of oats, bran, and linseed cake. During July and the early part of August, until sale time, they are fed on cabbage and rape, with about 1 pound of grain. The ewe lambs are fed on vetches, cabbages and rape, with no grain, unless the green feed is scarce, when $\frac{1}{3}$ or $\frac{1}{2}$ pound per day is given. From September until the 1st of May they are folded on turnips, swedes, and kale, with $\frac{1}{2}$ pound per day of grain and straw, chaff, or clover hay, and a due allowance of Davis Stock Food.



Mrs. M. Armer and her Prize Winning
Angora Buck,
PASHA COLUMBIA.
Owned by
MRS. M. ARMER,
Kingston, N. M.

A famous breeder of Lincoln sheep advocates liberal feeding of Davis Stock Food and very frequent changes of pasture for lambs from weaning time until the following spring. He divides his lambs according to sex, but feeds all alike. The principal feeds used are green clover, tares, rape, and turnips. During the fall and winter they are fed on turnips, and fed all they will eat up clean of cut clover hay in which is mixed about $\frac{1}{2}$ pound per head per day of linseed cake.

A Shropshire breeder feeds as follows: At weaning time, which is about the 1st of June, when the lambs are three months old, they are divided into two flocks, the rams in one and the ewes in another, and are given the best green crops available. Vetches are preferred, then clover, rape, kale, cabbages, early turnips, and swedes, in the order named. The lambs are always allowed the run of a new grass lot during the day for several hours, and when the crops are harvested they are changed to the stubble fields. When old mangels are available they are given for a few weeks, sliced. Some grain is fed, about $\frac{1}{8}$ pound per day at the beginning, and gradually increased, so that when the lambs are six months old they are eating about $\frac{1}{2}$ pound each per day, Davis Stock Food being used the entire period. During the fall and winter they are pastured on turnips and have the same grain allowance, with as much good clover hay as they will eat at all times. This man always keeps rock salt in the troughs and sprinkles about 1 pound per day of common salt on the feed of each seventy-five lambs.

A breeder of Suffolk sheep who weans his lambs about the middle of June, when they are four and one-half months old, feeds as follows: The ram lambs are separated from the ewes and fed on white clover, cabbages, rape, and kohlrabi, cut and fed in troughs. In addition they have from $\frac{1}{2}$ to 1 pound each of grain per day and Davis Stock Food, the object being to push them ahead rapidly so that they will be of good size at sale time, in August or September. The ewe lambs are put on trifolium and vetches, which are followed by rape, cabbage and mustard, with the run of the stubble fields when ready. If in good condition no grain allowance is given, but if not, about $\frac{1}{3}$ pound per day is fed. During the fall and winter they are fed on white turnips and swedes, with about $\frac{1}{2}$ pound per head daily of grain and a liberal allowance of pea straw or clover hay. When the turnip supply is not sufficient, cut mangels are given in the spring.

The methods of feeding practiced on other farms are very similar to the foregoing. Green feed is always given during the summer and fall until the turnip crop is ready, then the turnips are the chief feed, with some form of roughage, usually clover hay, and a small allowance of grain and cake, which in nearly every instance is a mixture of oats, wheat, bran, linseed cake and Davis Stock Food.

Fattening Lambs for Market.

In the feeding and fattening of lambs for market rather distinct methods are pursued. Those who rear early lambs aim to grow them rapidly, so that they will be ready for the market in June or the early part of July. The advantages claimed for this method are that it yields quick returns, that the lambs are sold before parasites becomes troublesome, and that it gives an opportunity to purchase a bunch of sheep or lambs for fall feeding, thus increasing the sheep carrying capacity of the farm and bringing in larger returns. Those who prefer late lambs believe that they do not require the same amount of attention as early lambs, that the ewes do not require so much special feeding, that warm sheds are not a necessity, and that the lambs can utilize the waste of the farm during the summer and fall, especially that of the stubble fields. Where late lambs are reared much care is necessary during the summer months, and old pastures must not be used as grazing grounds, as in them the parasites are almost sure to attack the flock and cause serious losses.

In rearing early lambs the mothers are very liberally fed on clover hay, grain, succulent feed and Davis Stock Food. The amount of roots fed is surprising, in some instances as much as 20 pounds per day per ewe, but from 10 to 15 pounds daily is considered very liberal feeding. Winter rye, winter barley, and kale are utilized before the grass comes. The lambs are taught to eat grain at a very early age, most of them eating well at three or four weeks. Special lamb pens or feeding creeps are provided for this purpose. In some instances a self feeder is used, but the majority of farmers prefer such feed fresh every day. The amount of grain fed is gradually increased until the lambs are eating from $\frac{3}{4}$ to $1\frac{1}{4}$ pounds per day each, at three or three and one-half months of age. This method of feeding is maintained even when the grass is abundant. The lambs are marketed when from three to four months old, weighing from 60 to 100 pounds each.

The more prevalent custom in feeding late lambs is to withhold all grain and utilize the pastures and stubble fields, with perhaps some green crops in emergencies, until after weaning time, which occurs in September. At that time lambs are generally fed on rape, kale, cabbage, or more often turnips. In addition to the succulent feeds supplied in the folds, the lambs are given a grain allowance of from $\frac{3}{4}$ to $1\frac{1}{4}$ pounds each day and a good stock food. Cotton seed or linseed cake or a combination of the two usually forms one-half to two-thirds of the concentrated feed. The remainder of the grain ration is oats, barley, beans, peas or corn, depending on the market prices. As a rule not much roughage is used in the fattening of lambs during the fall, but those who do furnish such feed use either clover hay or straw chaff. The chief reliance is placed on the use of green crops and roots, especially turnips.

Fattening Sheep.

The general tendency is to market lambs, but a considerable amount of sheep feeding still exists in all parts of the country. Some of these animals are natives, but a considerable number come from Ireland and Scotland, especially from the Scotch Highlands. The fall and winter method of feeding is much the same as that practiced in the lamb feeding. Feeding on green crops or on the root crops is the general custom. In addition grain and cake are given to the extent of from 1 to 2 pounds per head per day, with a fair allowance of Davis Stock Food. In some instances dried brewers' grains are fed with cake.

Where yard or shed feeding is practiced during the winter the ration usually consists of from $\frac{3}{4}$ pound to 2 pounds per head per day of clover hay, mixed hay or straw chaff, from 12 to 20 pounds of roots, and from $\frac{3}{4}$ to $1\frac{1}{2}$ or possibly 2 pounds of grain, cake, and Davis Stock Food. Some farmers fatten their sheep on grass alone, feeding in addition cotton seed or linseed cake, or a combination of the two, to the extent of from 1 to $1\frac{1}{2}$ pounds per sheep per day.

Sheep Raising in Scotland.

Sheep, either as a specialty or as an important adjunct to the regular farming operations, are raised in all parts of Scotland. In the farming country, where the rent values are from \$5.00 to \$15.00 per acre, sheep are considered indispensable, as they not only generally give handsome returns in mutton and wool for the feed consumed and labor expended, but also increase the fertility of the soil. The Scotch farmer values sheep very highly as soil improvers. Although the use of commercial fertilizers is very common in all parts of the country, the farmer who takes possession of a worn out farm invariably resorts to

sheep feeding as the surest and quickest method of enriching his land. On the hill and mountain land sheep are grown in large numbers. With high and well drained land the conditions in Scotland are well suited to the production of sheep, as many parasitic troubles which so often cause heavy losses among the flocks of England are almost unknown in Scotland. The climatic conditions are favorable to the growing of roots, especially turnips, which form the basis of practically all sheep feeding. The fall and winter months are generally open and permit the grazing of the turnip crop, eliminating a great deal of labor in harvesting and saving the labor of handling the manure.

Sheep folded on turnips are always fed from $\frac{1}{2}$ to $1\frac{1}{4}$ pounds each per day of grain and cake, this feeding being relied upon to enrich the manure. The influence of sheep husbandry on the fertility of the soil is generally recognized as of sufficient value to compensate for the labor expended and for one-third of the total cost of the grain and cake fed. In some sections of the country the terms of the lease entitle a farmer who is giving up a farm to reimbursement for one-third of the total cost of all cake fed on turnip ground during the year. The influence of sheep feeding on the soil is so great that many farmers claim that they cannot afford to be without sheep. Two and three year old wethers are considered the most valuable and ewes in lamb the least valuable to improve the soil fertility.

The tendency now is to use younger sheep in feeding than in former years. The lambs grown on the arable farms are nearly all marketed under one year of age, while in former years they were fattened as yearlings and two year olds. The hill and mountain sheep are also finding an earlier market. The change in the age of feeding sheep has been brought about by the demand of the retail dealers for smaller carcasses to supply smaller cuts. Furthermore, mutton from young sheep can be sold at once, as it does not require several weeks to ripen, as is the case of that from two and three year old wethers.

Feeding Pure Bred Flocks.

In the management of pure bred flocks Scotch farmers, as a class, use more simple methods than those of England, and there is not the same tendency to force young sheep. The lambing season is later, both on account of the colder climate and because the absence of danger from parasites obviates the necessity of getting lambs off the pastures early. March and April are the usual months. In the management of breeding flocks breeders give plenty of natural feeds, outdoor exercise and fresh air.

Feeding Breeding Rams.

During the breeding season most of the breeding rams are allowed to run with the ewes night and day, and, as a rule, they receive no other feed than that obtained in the grass lot. Young and growing rams or old thin ones are often given a good stock food and some additional feed. The feed used varies on different farms, in some instances a mixture of linseed cake, oats and bran is given, while on other farms oats alone or oats and cabbage are fed; about 1 pound per head daily of the grain mixture is fed. Outside the breeding season rams are fed moderately. During fall and winter they are on good pasture when the weather is favorable, and are given hay (clover preferred) and turnips or cabbage. Up to the opening of the breeding season rams are allowed the run of a grass lot, with no additional feed.

Feeding Breeding Ewes.

In the feeding of breeding ewes good care and feed are given just previous to and at lambing time. Breeders, especially those who breed Leicesters, do not, as a rule, flush their ewes to the same extent as the English breeders. Those who handle the Down breeds give more attention to this point using meadow aftermath, stubble, cabbage, rape or grain. After the ewes are safe in lamb they are not given additional feed to that obtained on pasture until the winter, when the best breeders allow ewes the run of a grass lot, feeding hay and cabbage or turnips in addition, without grain, until two or three weeks previous to lambing time.

Where early lambs are produced the ewes are fed very liberal rations just before lambing, being given a daily ration of clover hay to the extent of $1\frac{1}{2}$ to 2 pounds, turnips 14 pounds, from 1 to $1\frac{1}{2}$ pounds of a mixture of equal parts of linseed cake, crushed oats and bran, and a reliable stock food. In some instances dried brewers' grains are given with linseed cake, instead of oats and bran, on account of the lower cost. The heaviest grain rations are always given to the ewes with twin lambs. The lambs are also taught to eat oatmeal or rolled oats, to which some linseed cake is added later on. After

grass has made a good start neither ewes nor lambs are given grain and cake until weaning. Ewes with lamb, during the latter part of March and early in April, are usually given some grain and cake for a few weeks, especially if the grass is backward in growth.

After the lambs are weaned the ewes are usually put on short pasture until the flow of milk has completely stopped, and in many instances remain there until the next breeding season.

Feeding the Lambs After Weaning.

The majority of lambs are weaned during August and September. In some instances they are allowed to run together until the middle of October, when the rams and ewes are divided. On other farms this division is made at weaning time. Grain is fed to all lambs, regardless of sex, for five or six weeks after weaning, so that they may have a good start and not lose the flesh made while suckling. The following methods prevail on the most successful farms:

A breeder of Leicesters weans his lambs in August. After weaning the lambs all run together until the middle of October, have a good grass lot, usually meadow aftermath, and receive about $\frac{1}{2}$ pound each per day of oats and linseed cake. When the ewes and rams are separated, the rams are put on cabbage or turnips and are carried in this way all winter, but the grain is increased to 1 or $1\frac{1}{2}$ pounds per day and a due allowance of a good stock food given. When the weather is open no hay is given, but in stormy weather or when the snow is on the ground some clover hay or mixed hay is fed each day. The ewe lambs are allowed the run of a grass lot all fall and winter and have some turnips in addition fed on the grass. In some instances they are folded on a turnip patch for a few hours each day, but grain is never given. This breeder aims at having his rams well forward as shearlings at sale time, which is about the first of September. With the ewe lambs growth and a robust constitution are the points sought for.

On one of the largest and most successful Shropshire farms, located in East Lothian, near Edinburgh, the manager weans his lambs during the first week in August, when the ewes and rams are separated. The ewes are put on second crop clover until turnips are ready, when they are fed turnips on grass and have some hay in addition until the following spring. The ram lambs are better fed. They are grazed on second growth clover, are fed on cabbages or turnips, and have in addition from $\frac{1}{2}$ to 1 pound of linseed cake and crushed oats each per day. During cold and stormy weather they are fed some clover hay.

Production of Sheep on the Hills and Mountains.

In the south and southeast of Scotland the Cheviot is the popular hill sheep, while in the western, central, and northern portions of the country, the hardy Blackfaced Highland sheep are used. They furnish the chief source from which the farmers in the arable districts secure their feeding sheep.

The mountain and hill sheep are bred and grown for feeders, and the allowance of feed is only sufficient to maintain the older animals and furnish a rather scanty diet for the growing ones. Therefore, the sheep require considerable time to reach maturity. In former years they were practically all retained on the hills until three and one-half years of age. They are now generally sold between two and one-half and three years of age. Many of them are fed as lambs and are ready for the butcher before nine months of age, and this system is growing in favor, but the great majority are sent down into the arable districts as lambs to be wintered, and are returned to the hills with the opening of spring to be sold as feeders the following year. If it were not for this practice, yearling wethers would be fed generally, but the majority of hill sheepmen consider it too soon to send their sheep back in six months' time, and therefore retain them until two and one-half years of age before marketing.

In some instances the lambs sent to the arable farms in the fall are not returned to the hills the following spring, but are either sold for immediate feeding or are grazed during the succeeding winter and summer to be sold later as yearling store wethers.

Grass, shrubs, and heather furnish the feed throughout the various seasons of the year. The ewes drop their lambs about the latter part of April or early in May, by which time the weather is usually favorable and there is sufficient grass to insure a good supply of milk. Neither ewes nor lambs get any other feed than grass during the summer and fall, and at weaning time the lambs are sent down to the arable districts to be wintered, so that they are not compelled to endure the hardships of the Highland winter. All other sheep, as a rule, are grazed on the hills and mountains throughout the entire

year. The average period of usefulness of the ewes is about five years. When five years old they are generally taken from the flock and sent to the arable districts, where they are fattened or, what is a more common and profitable practice, bred to a first class mutton sire. In the latter case they rear one crop of lambs. Both ewes and lambs are fattened for the early summer market. Young ewes, not needed for breeding purposes, are sold in the fall to feeders or to Irish hill farmers, who breed them to high class mutton sires to produce feeding sheep.

Fattening for Market.

The feeding of sheep and lambs for market is the most important branch of Scotch sheep industry. The great bulk of the work is done during the fall and winter. Many farmers feed at this time of the year who do not keep any sheep on their farms throughout the remainder of the year, especially where very intensive farming prevails. In such cases the sheep or lambs are folded on the turnip fields. Where the land is not so valuable and the rents are low, many farmers keep a large portion of the land under grass and feed sheep during spring and summer. There are a great many farmers who breed practically all of their own feeders, but these men either have cheap grazing land or they raise early lambs, which are grain fed from the time they will eat until they are marketed, and others raise one crop of lambs from cast off hill ewes, as already mentioned.

Producing Lambs for Early Summer Market.

In certain parts of Scotland considerable attention is given to the production of lambs for the early summer market. Those farmers who are making a success of this have warm pens for the ewes and lambs, and give the ewes very liberal rations, and the lambs are fed grain and cake as soon as they will eat. The lambs are dropped during the latter part of January and February and are forced until May or June, when they are marketed. The ewes are fed from $1\frac{1}{2}$ to 2 pounds each per day of clover hay, from 12 to 16 pounds of turnips, and from 1 to $1\frac{3}{4}$ pounds of a mixture of wheat bran, crushed oats and linseed cake; the larger allowances are fed to those with twin lambs. The lambs are fed in creeps, and given all they will eat of oatmeal and rolled oats at first, and later on crushed oats, cracked corn, and either linseed or cotton seed cake; a good stock food being used regularly. Lambs at four weeks old will eat about $\frac{1}{8}$ pound each day, while at three months old they will take from $\frac{2}{3}$ to 1 pound each. When fed in this manner they make very rapid growth and are always well fleshed.

Fattening Hill and Mountain Ewes and Lambs.

When hill and mountain ewes are brought to be bred to a mutton sire for one crop of lambs, they are bred to drop their lambs in March, and during pregnancy are given the run of grass or stubble land, with some turnips, so as to be in fair condition at lambing time. A few weeks previous to lambing they are fed oats and linseed cake, or brewers' grains and linseed cake. From lambing time they are fed well until marketed, the lambs having the same ration as soon as they are old enough to eat it. Grain and cake are given until the grass is good, but after that time cake alone is fed, the amount varying from $\frac{1}{3}$ to $\frac{3}{4}$ pound per lamb per day, and from $\frac{3}{4}$ to $1\frac{3}{4}$ pounds per ewe per day. The lambs are marketed when from three to four months of age, and if ready the ewes go at the same time, but generally they require about four weeks more liberal feeding on cake to finish them.

Fattening Lambs for Market.

Lambs for fall or winter feeding are usually purchased in the month of September, or if home bred are weaned at that time. They are first given the run of the stubble land for a few weeks and are gradually taught to eat turnips, and later are folded on the turnip land. In addition they are fed cut hay and a liberal allowance of grain and cake—largely cake. When the lambs are on common turnips, many successful feeders feed cotton seed cake and dried brewers' grains, equal parts by weight, to the extent of from $\frac{1}{2}$ to $\frac{3}{4}$ pound per lamb per day. Should the root be changed to swede turnips the grain ration is changed to two parts linseed cake, one part cotton seed cake, and one part dried brewers' grains. Swede turnips are thought by sheepmen to be more difficult to digest than common turnips, and the addition of linseed cake is supposed to assist digestion. The grain allowance is increased during the finishing period, and may be changed to eliminate the brewers' grains, but cake is practically always used as a part of the ration. Some farmers do not put their lambs on the turnip fields so soon, but first graze them for two or three months.

The fall and winter methods of fattening sheep are very similar to those described for lambs. They are usually fed on roots, with a grain and hay ration in addition. Roots are usually sliced for sheep which are teething. The amount of hay and grain is not large, but as much as 25 pounds of roots per head is fed daily. Practically all feeding is done in the open.

Sheep Production in Ireland.

With an abundance of grass and a temperate climate, the conditions of Ireland are very favorable to sheep raising. For years Irish farmers have given most attention to the production of sheep for feeding and the finishing of sheep on grass alone for market, but recently the breeding of pure bred sheep and the fattening of sheep for mutton have increased, and it has resulted in the adoption of improved methods of feeding.

Feeding Pure Bred Flocks.

The methods of feeding pure bred sheep resemble those of England in some respects, but as a rule fewer forage crops are grown and a much more liberal use is made of grass, and smaller amounts of grain, hay, and succulent feeds are used. Throughout a great deal of the country grass alone in its season is the principal feed for breeding sheep.

The Production of Feeders.

The production of feeding sheep is an important industry in Ireland. The tenant farmers, especially in the western and southern portions, grow some feeders each year, and although the number kept by each individual is generally small the total production is large. These sheep do not receive a great deal of care, but when the pastures are not too heavily stocked they do well. Winter feeding is not resorted to except in the case of a prolonged period of severe weather, which seldom happens.

In the mountains and hilly districts feeders are raised in rather systematic manner. Large numbers of Blackfaced Highland ewes are annually purchased in Scotland and bred to high class mutton sires. The Scotch ewes drop their lambs about the latter part of April or the first part of May, when the weather is warm and the grass abundant. They run on pasture at all seasons of the year, and are thus maintained very cheaply. The feeders are generally sold when one and one-half years old.

Fattening Sheep for Market.

In central Ireland the fattening of sheep for mutton is receiving considerable attention. On good land nothing but grass is given, but where the soil is not so good and the yield of grass per acre less some additional feed is usually supplied. The principles are practically the same as those of the English feeders, smaller amounts usually being fed. One very successful ration is equal parts of cotton seed cake, linseed cake, and cracked corn. The length of the feeding period varies from sixty to one hundred and fifty days, depending on the condition and age of the sheep and the condition of the markets.



POULTRY RAISING ON THE FARM.

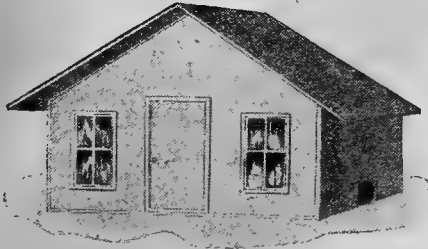


Figure 1.
Implement House Transformed
Into Poultry House.

larger consumption of poultry products per capita in the United States, it is of prime importance that there should always be an abundant supply of strictly fresh eggs and of the best grades of table poultry. This condition is also a necessary factor in the development of the export trade. When the markets are filled with eggs which have lost their quality and flavor by long keeping, and many of which have acquired an offensive taste; when the broilers and the roasters offered to the consumer are thin, tasteless, tough, and altogether unfit for the table, it is not surprising that



Figure 2.
Implement House Transformed Into
Poultry House.



Figure 3.
A Lean-to Poultry House.

to the care and intelligence with which the market is supplied.

Increase of Product.—There is no stock on the farm that yields a better relative return to the feed consumed than do the hens, and consequently it is well worth while to consider in what manner their product may be increased without disproportionately increasing expenses.

The fowls must have comfortable and healthful quarters; they must have proper feed and nesting facilities, but it is not at all necessary that there should be extravagant expenditures in supplying these.

The barnyard fowls are regarded by most farmers as a very insignificant part of their live stock; and yet, though so often neglected and forced to shift for themselves, the poultry and egg crops constitute in the aggregate one of the most important and valuable products of American agriculture. The conditions in this country are such that the poultry industry is capable of indefinite expansion, and therefore able to meet any demands that may be made upon it either by home or foreign markets.

Importance of High Grade Product.

—In order to secure a larger consumption of poultry products per capita in the United States, it is of prime importance that there should always be an abundant supply of strictly fresh eggs and of the best grades of table poultry. This condition is also a necessary factor in the development of the export trade. When the markets are filled with eggs which have lost their quality and flavor by long keeping, and many of which have acquired an offensive taste; when the broilers and the roasters offered to the consumer are thin, tasteless, tough, and altogether unfit for the table, it is not surprising that they are passed by and beef, mutton, or pork taken in their stead. So, also, when the exporter is buying for consignment to foreign markets, he must be able to find at all times a good quality of eggs or poultry in sufficient quantity or he cannot continue to buy our products. All of which should emphasize the necessity of the proper selection of feeds and their use.

Possibility of Increased Consumption.

—An increased supply of poultry products of the highest class would unquestionably lead to an increased consumption. There is no more staple and popular article of food, and consequently we may confidently expect the demand to develop in proportion to the increase of our population and

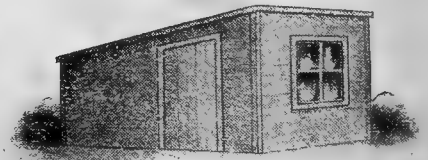


Figure 4.
Simple Form of Poultry House

The Kind of Fowls to Keep.

The kind of chickens to be kept upon a farm depends almost as much upon the kind of man who manages them as upon any other condition. There are no birds which stand neglect better than the common, mongrel barnyard fowls, for these have lived and developed under unfavorable conditions, and are accustomed to shift for themselves. They are generally hardy and vigorous, and yield a fair return in eggs or as table poultry; they respond fairly well to generous treatment, and, if selected with some care, are by no means to be despised, even when their product is compared with that of the standard breeds.

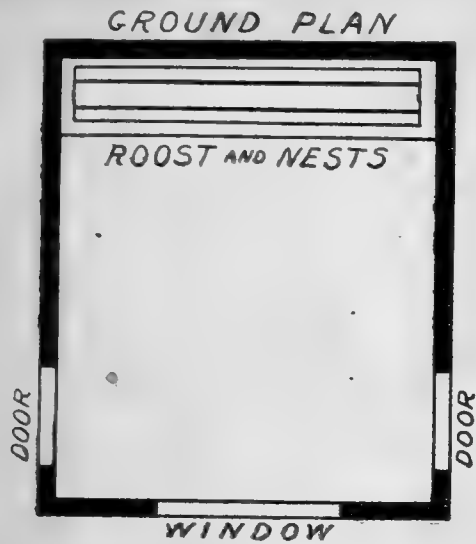


Figure 5. Ground Plan of Simple Form of Poultry House, Shown in Figure 4.

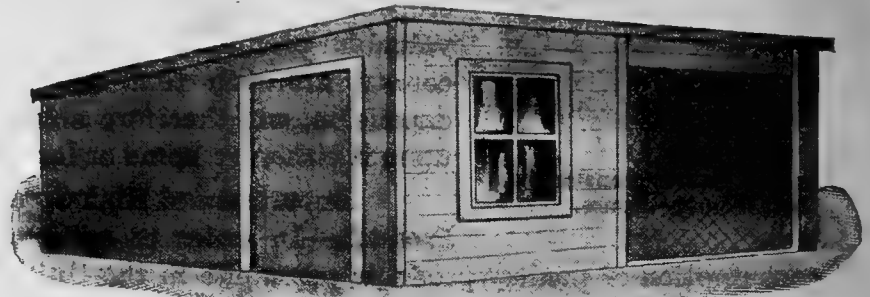


Figure 6. Poultry House with Scratching Shed.

Improvement of Breeds.

The improvement of the common poultry should begin in most cases by breeding from birds selected for their shape, size and productiveness, and by bettering the condition of life under which they are kept. If the owner is willing to go a little further, and to bestow somewhat more attention upon his birds, he may cross them with males of a standard breed or replace them entirely by pure bred males and females.

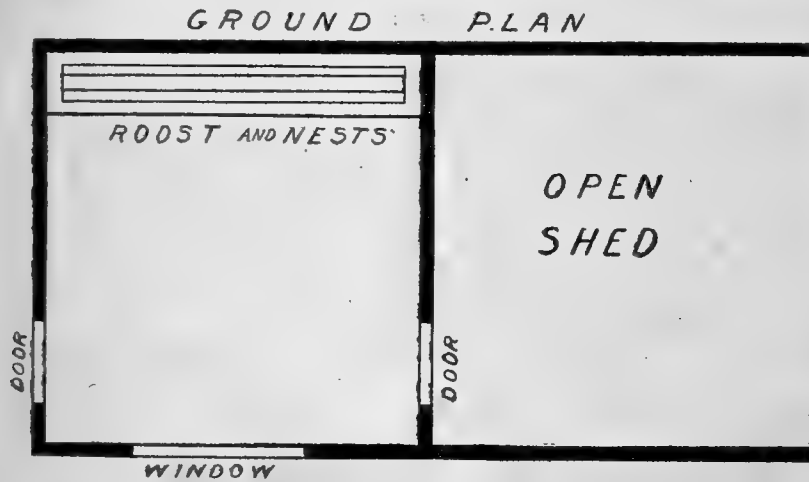


Figure 7. Ground Plan of Poultry House with Scratching Shed, Shown in Figure 6.



Figure 8. Construction of Roosts.

Care of Fowls.

The standard breeds have been brought to a higher plane of development by extra care and a more skilful management, and if they are to maintain this improvement they must be continued under the conditions which brought it about. They suffer more from neglect and unhealthy surroundings than do the common fowls, because less accustomed to these conditions. The standard breeds, for these reasons, may not always give satisfaction, if their characteristics and requirements are not understood. If, however, the poultryman expects adequate results, and is willing to give that care and skillful management necessary, then a breed of fowls should be adopted which has been bred for generations for a special purpose and in that line developed to the highest degree.

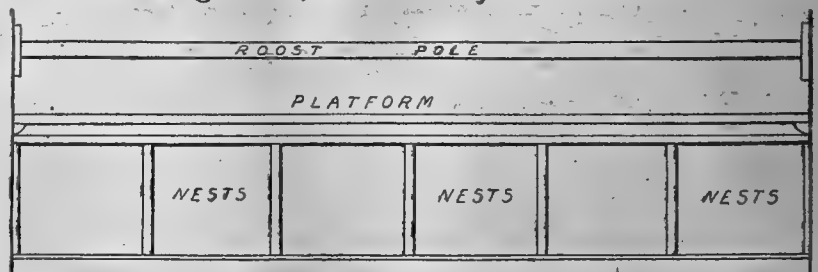


Figure 9. Sectional View of Platform and Nests.

Popular Varieties.

The most popular fowls in the United States are the American breeds known as the Plymouth Rocks and Wyandottes. They are of medium size, good as broilers, good as roasters, good egg producers; the hens are good sitters and good mothers; and for these reasons they are known as general purpose fowls.

In the Barred, Buff, and White Plymouth Rocks, and the White, Buff, Silver, Golden, Black, and Partridge Wyandottes, there is a sufficient range of color to meet almost any taste.

Egg Production.

For farmers who desire fowls more particularly for egg production, the Mediterranean breeds, particularly the Leghorns, Minorcas, and Spanish, are to be recommended. The birds of these breeds are smaller, more active and greater foragers than the Plymouth Rocks or Wyandottes, and as layers they are unsurpassed. Should it be desired, on the other hand, to raise heavier birds than the Plymouth Rocks, we should naturally turn to the Asiatic breeds, which include the Brahmas, Cochins, and Langshans.

The Standard Weights of These Different Classes are as Follows:

BREEDS	Cocks, Pounds	Hens, Pounds
Plymouth Rocks	9½	7½
Wyandottes	8½	6½
Light Brahmas	12	9½
Dark Brahmas	11	8½
Cochins	10½-11	8½
Langshans	10	7
Minorcas	8	6½
Spanish	8	6½

The Leghorns are smaller than the Minorcas and Spanish, and have not been given standard weights. The Rhode Island Red is a promising general purpose breed, resembling in size and form the Plymouth Rock. It has been developed by crossing and selection, but has not yet been admitted as a standard breed.

Selection of Stock for Breeding.

Having in mind the size and peculiarities of the varieties of fowls to which reference has been made, it would not appear to be a difficult matter to select one which will satisfy the requirements of any farm. In purchasing breeding stock it is important to purchase from reliable breeders only, and to ascertain that the stock is in healthy condition and that it has been bred for early maturity, size, shape and egg producing qualities, rather than for perfection in feathering. For the show room the feathering cannot be neglected, as the judges often place it ahead of all other features of the bird's make up; but for the farm the color and marking of feathers must be held subordinate to the utilitarian qualities. The feathers should not, however, be entirely neglected, as their perfection is an indication of the purity of blood and carefulness of breeding.



Figure 11. Concealed or Darkened Nest.

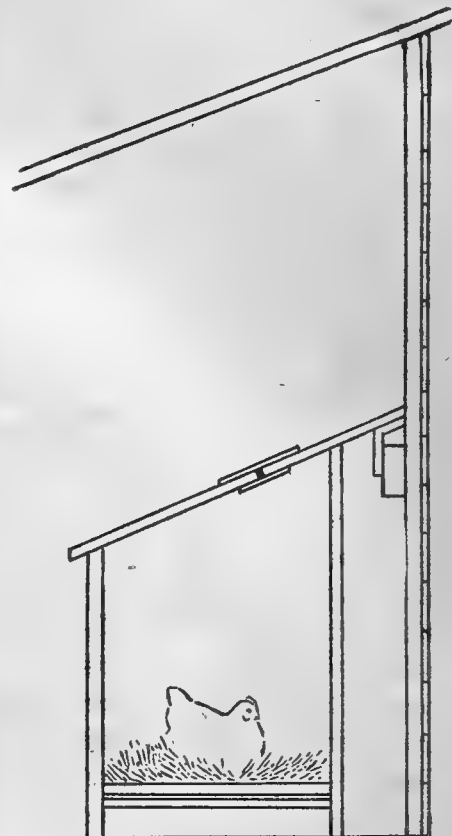


Figure 10. Sectional View of Concealed or Darkened Nest.

Poultry Houses.

It is very desirable that poultry should be provided with a house somewhat separated from the other farm buildings, but near enough to the barnyard so that they can spend a part of their time in scratching for and gathering up the many seeds and grains which otherwise might not be utilized. On farms where no poultry house

is provided the hens are compelled to seek roosting places wherever they can find them—sometimes in fruit trees; sometimes on feed racks; sometimes on the farm machinery, or even the wagons and carriages. The result is not only untidiness, but fruit, feed, implements and wagons are soiled and

injured by the droppings, and sometimes vermin swarm in the roosting places to such a degree that the hens are voted a nuisance rather than a desirable part of the stock farm. If these vermin infested places are near the horse stable the mites may attack the horses, causing itching and a mangy condition of the skin, the origin of which is not always suspected.

Selection of the Site for Building and Yard.

Too often the location of the poultry house is thought to be of minor importance, and consequently is given less consideration than that of any other farm building. The other buildings are frequently located first, and the poultry house then placed on whatever space may have been left, when it ought to have had due consideration before the other buildings were located. In caring for the various classes of live stock the question of labor has always been an important item. The class that requires the closest attention to detail, as a rule, requires the greatest amount of labor; and, as poultry keeping is wholly a business of details, the economy in performing the necessary work is of great importance. If the poultry house is not conveniently located and arranged, it becomes expensive on account of unnecessary labor. As it is necessary to visit poultry houses several times each day in the year, their arrangement is of more importance than in the case of any other farm building. The operations must be performed frequently, so that any little inconvenience in the arrangement will cause not only extra expense and care, but, in many cases, more or less neglect of the operations that should be performed each day. Again, poultry houses are likely to be infested with rats and mice unless some means are provided to exclude them. And all this should be given due consideration in the selection of the location. Taken all in all, it is usually best to locate the poultry house at some distance from the other farm buildings, especially if grain is kept in the latter.

A dry, porous soil is always to be preferred as a site for poultry buildings and yards. Cleanliness and freedom from moisture must be secured. Without any doubt, filth and moisture are the causes, either directly or indirectly, of the majority of diseases among the poultry. They form the stumbling block which brings discouragement and failure to many raisers. It must not, however, be inferred from the above that poultry cannot be successfully reared and profitably kept on any soil, for

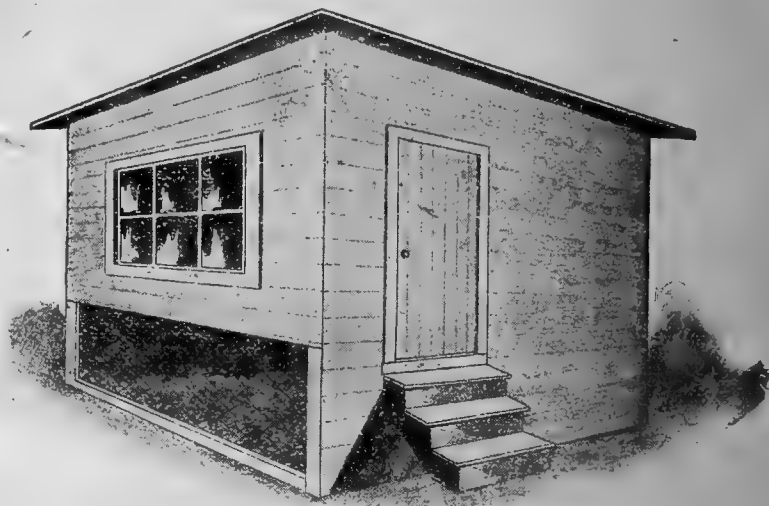


Figure 12. Scratching Room under Poultry House.

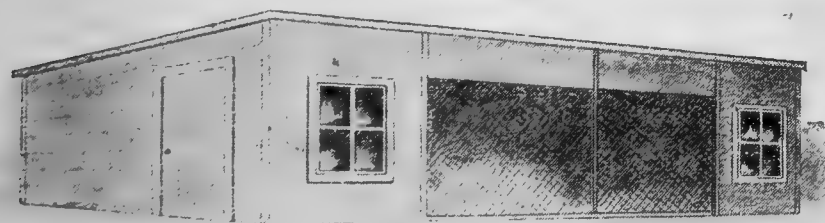


Figure 13. Double Poultry House with Scratching Sheds.

abundant proof to the contrary is liberally furnished by the phenomenal success of some of our largest poultrymen. The necessity for cleanliness, however, is not disputed by those who have had any extended experience in the poultry business. That an open, porous soil can be kept comparatively clean with much less labor than a clay soil will be evident to those who are at all acquainted with the habits of domestic fowls. When the fowls are confined in buildings and yards the part of the yard next the building will become more or less filthy from the droppings and continual tramping to which it is subjected. A heavy or clay soil not only retains all the manure on the surface, but by retarding percolation in times of frequent showers it will give the whole surface a complete coating of filth. If a knoll or ridge can be selected, where natural drainage is perfect, the ideal location will be nearly approached. Where naturally favorable conditions of drainage do not exist, thorough draining will go a long way toward furnishing the necessary surroundings to insure success. We do not mean by this that elaborate and expensive structures and surroundings are necessary.

Sometimes there is already a small building on the farm which has been used for implements or animals and which is no longer required for these purposes. Such a building can easily be fitted for poultry by cutting a small door in one side and placing roosts and nests in the interior, and the drainage, etc., can easily be arranged.

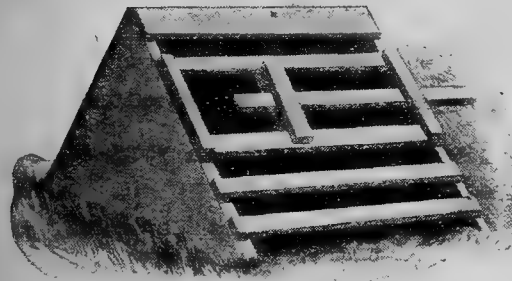


Figure 15. Common A-shaped Coop with Sliding Slab.

A scratching shed may be attached to the side of this house, as in Figures 6 and 7, which, if desired, may be enclosed in front with poultry wire, so as to keep the birds confined.

Fittings.

Roosts.—The details of construction of roosts are seen in Figure 8. The important points are a nearly flat or slightly rounded surface on the upper side and as few cracks and crevices as possible in which vermin may hide. The roosts may be made of 2x3-inch scantling and should be so put in that they can easily be removed at any time for cleaning and disinfection.

A platform is often placed under the roosts to catch the droppings, and the nests are placed under this platform. In a house, such as Figure 9, a manure platform may be dispensed with and the nest boxes placed along the front or sides of the building, sand being placed under the roosts for the droppings.

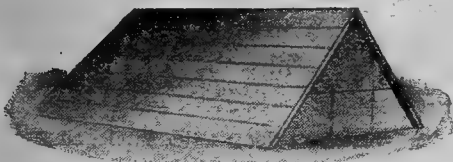


Figure 17. A Common Form of Chicken Coop.

With heavy fowls, which are apt to break their eggs in fighting with other hens that try to enter their nests when they are laying and thus acquire the habit of egg eating, a more concealed or dark nest may be necessary.

(Figures 10 and 11.)

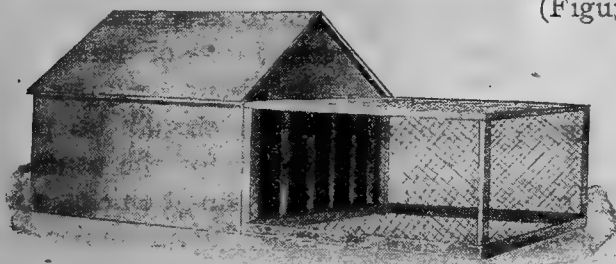


Figure 19. Chicken Coop with Enclosed Run.

and ratproof, if not too expensive. A board floor, 6 or 8 inches above the earth, with good ventilation under it, is dry, but too cold, except in the South.

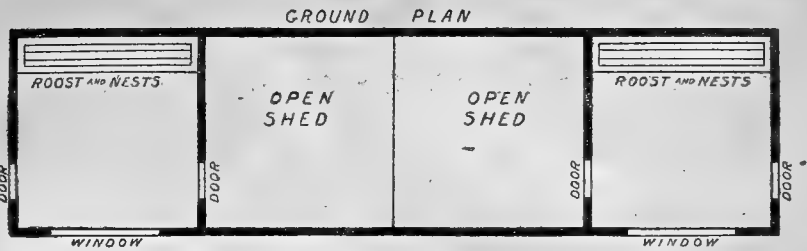


Figure 14. Ground Plan of Double Poultry House with Scratching Sheds.

Inexpensive Structures.

In case there is no building suitable for remodeling into a poultry house, an inexpensive lean-to may be built, although we do not advise it (Figure 3), or a new building constructed. A house for this purpose should be planned with a view to simplicity, economy and convenience, while supplying the conditions proper for successful poultry feeding.

One of the simplest forms of poultry houses is shown in Figure 4, and ground plan for the same in Figure 5.



Figure 16. A Common Form of Chicken Coop.

A platform is often placed under the roosts to catch the droppings, and the nests are placed under this platform. In a house, such as Figure 9, a manure platform may be dispensed with and the nest boxes placed along the front or sides of the building, sand being placed under the roosts for the droppings.

Nests.—The simplest form of nest is a box placed upon the floor of the poultry house.

With heavy fowls, which are apt to break their eggs in fighting with other hens that try to enter their nests when they are laying and thus acquire the habit of egg eating, a more concealed or dark nest may be necessary.

(Figures 10 and 11.)



Figure 18. Chicken Coop with Enclosed and Covered Run.

Floor.—One of the most troublesome parts of the poultry house to make satisfactory is the floor. Many use earth floors, but these are often damp, especially in cold weather, and they induce rheumatism, colds, roup, digestive disorders, and various other diseases. Some have put in cement floors, but have found these cold and also more or less damp. Probably a good cement floor, laid in broken stone and covered with a few inches of earth, sand preferably, would be satisfactory

A double flooring, laid tightly with building paper between, or a good single flooring, covered with a few inches of dry earth, is probably the best. In all cases of board floors there should be a sufficient space beneath for ventilation and to guard against the lodgment of rats.

Good Plans.—A good style of poultry house, with scratching room under it, is shown in Figure 12. In case more than one flock is to be kept, the plans shown in Figures 13 and 14 have been found satisfactory and may be multiplied to any extent by adding to the ends. With such houses there may be fenced runs at the back or front, or both sides, so that the birds



Figure 20. Chicken Coop with Enclosed and Covered Run.



Figure 21. Chicken Coop with Enclosed and Partly Covered Run.

may be kept confined. The amount of space to be allowed for each bird depends upon the size of the bird, whether a shed is attached to the house or whether the fowls have the free run of the open fields. For birds in confinement there should be from 6 to 15 square feet for each adult bird in case there is no shed attached to the house; and with a shed this space may be reduced about one-half. The yards should be large enough to allow exercise in the open air, and to furnish more grass than the birds will eat. This will vary from 60 to 150 square feet for every adult bird.

The open shed facing the south, where the birds can be induced to hunt for their feed and take exercise in all seasons of the year, and where they can enjoy the pleasure of scratching and dusting themselves in the sunshine, even during the winter months, is of great assistance in maintaining the health and productiveness of the flock. The roosting space allowed should be 6 to 8 inches for the smaller breeds, 8 to 18 inches for the medium breeds, and 10 to 12 inches for the larger breeds.

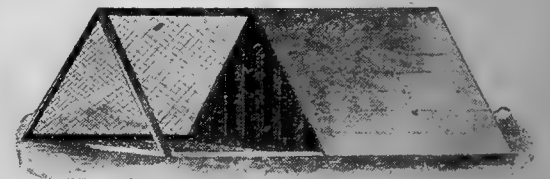


Figure 22. Chicken Coop with Enclosed Run.

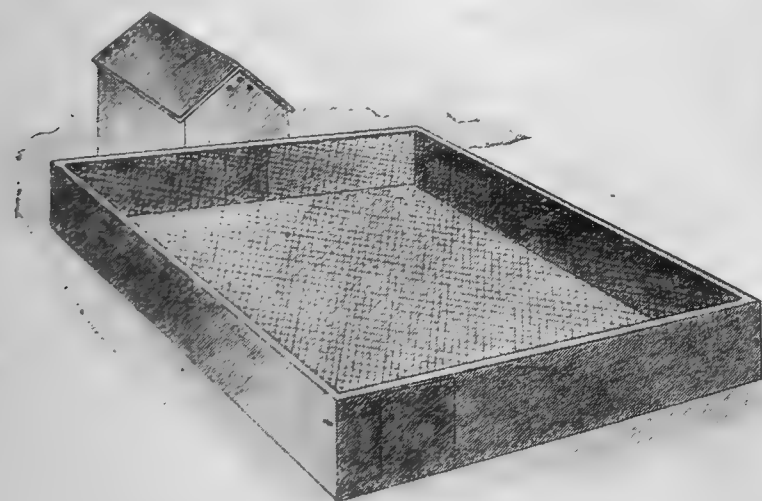


Figure 23. Chicken Coop with Barred and Enclosed Hawkproof and Catproof Run.

The common A-shaped coop is one of the most easily constructed and convenient forms in use. The one disadvantage connected with it is the difficulty of removing the feeding and drinking vessels for

Space to be Allowed.

The amount of space to be allowed for each bird depends upon the size of the bird, whether a shed is attached to the house or whether the fowls have the free run of the open fields. For birds in confinement there should be from 6 to 15 square feet for each adult bird in case there

Ventilation.

Poultry houses should be well ventilated, but so arranged that the drafts of air will not strike the birds. Windows and doors should be provided in such locations that the sun may shine into the building during a considerable part of the day. Sunshine is required both to keep the houses dry and to destroy various forms of infection.

Poultry Coops.

A liberal supply of coops should be provided for the confinement of hens with broods of small chicks, and for those hens which insist upon sitting at inconvenient times a few days in solitary confinement will usually break up the desire to sit, and the hen will soon after resume laying.

cleaning or of catching the bird in it without danger of some of the birds escaping. To obviate this one of the slabs may be made to slide, as shown in Figure 15. The opening made by sliding this slab is sufficient to admit the hand and arm so that any part of the coop may be reached without leaving an avenue of escape unguarded. Other forms of coops for the same purpose are illustrated by Figures 16, 17, 18, 19, 20, 21 and 23. For early hatched chicks, which come out when the atmospheric temperature is so low as to be injurious to them, a combination of coop and glass covered run, as shown in Figure 24, has been found very useful.

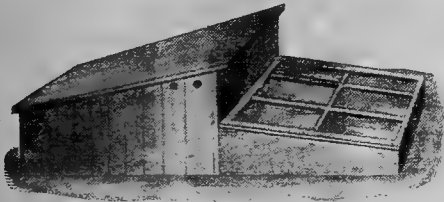


Figure 24. Coop with Glass Covered Run.

Feed Troughs and Drinking Fountains.

Two forms of feed troughs are represented in Figure 25. For small chicks the troughs must be very shallow, or, for the first few days, the feed may be placed upon a square piece of board. Numerous forms of drinking fountains have been devised, two of which are represented in Figures 26 and 27. A good fountain is easily made by cutting a small aperture in a tin can, as is shown in Figure 28, filling the can with water, covering with a shallow pan or vessel of any kind, and then inverting the whole. The shallow vessel will remain filled with water as high as the top of the aperture until the can is exhausted. It is important that fresh, pure water should always be accessible to fowls, and the drinking fountains should be cleaned and filled two or three times a day, if possible, and under no circumstances less frequently than once a day.



Figure 25. Two Forms of Feed Troughs.

Under such circumstances fowls take care of themselves so well and are so energetic in seeking their feed that they are either forgotten and allowed to shift for themselves when they really need attention and assistance, or they are regarded as a nuisance because they sometimes do a little damage. When fenced away from the gardens and flower beds, fowls do little damage and cause scarcely any annoyance on a farm. On the other hand, they do an immense amount of good in the protection of crops by the destruction of injurious insects, larvas and worms.

Ranging of Fowls.

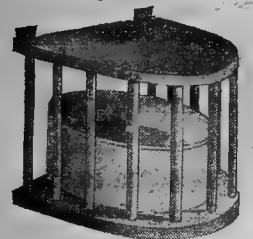


Figure 26. A Form of Drinking Fountain.

Sometimes it is advisable to divide the farm flock into colonies and place these at different points upon the farm in order to secure additional range; to remove the birds temporarily to a distance from certain crops, or for other purposes. In this case a cheap, light, and easily handled colony house (Figure 29), may be constructed and placed where the fowls are desired to range. After being confined in these houses a few nights the birds will adapt themselves to their habitations and return to them.

Colonies.

There are certain special lines of agricultural operations with which poultry raising may be advantageously connected. In dairying there is usually a large quantity of skim milk or buttermilk which may be utilized to furnish a considerable part of the poultry ration. There is also much feed to be gathered by fowls about the stables, manure piles, and pastures which would otherwise go to waste.

Poultry in Combination With Specialties in Farming.



Figure 27. A Form of Drinking Fountain.

Advantages on Fruit Farms.

Upon the fruit farm fowls are also of advantage. They keep down the insect pests, and they may have a free range the greater part of the season without the possibility of doing any damage. Plum growers have found poultry especially helpful in keeping down the curculio, and even apples have been considerably benefited. If small fruits are injured, they may, of course, be protected by confining the fowls for the limited season when the fruit is ripening. The waste fruits, either in winter or summer, are a welcome and valuable addition to the poultry ration.

Poultry and the Market Garden.

The market garden also furnishes a large amount of waste products which may be utilized for poultry feed. There is the waste lettuce, the small heads of cabbage, the unsold beets, carrots and potatoes, the peas and corn which cannot be marketed for any reason, the waste of the small fruits, etc. If properly cared for the hens will bring a steady and reliable income during the winter months. Dried clover and other green feed, roots and tubers should be saved for them during the summer. These should be steamed and fed with Davis Poultry Food in the mash, or cabbages and beets may be fed raw. A catch crop of buckwheat or oats and peas will furnish much feed at little expense. Bran, Davis Meat Meal, wheat screenings, and oats purchased for poultry will bring good returns in eggs and will also add materially to the fertilizer supply.

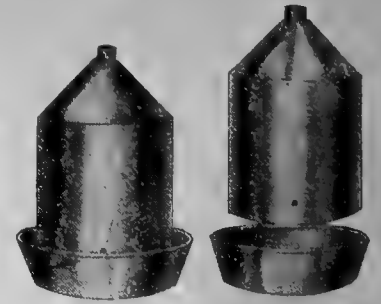


Figure 28. A Drinking Fountain Made of a Can.

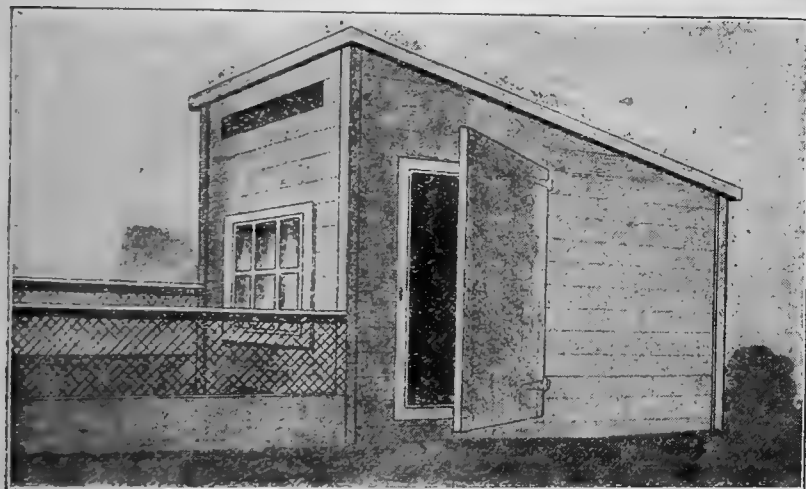


Figure 29. Colony House.

In the following pages we give a brief description, together with illustrations, of the various varieties of chickens. Each of them is described fully, thus enabling the starter in the poultry business to familiarize himself thoroughly with the various breeds.

1. **American Class.**—Barred, Buff, Pea Comb Barred, and White Plymouth Rocks; Silver, Golden, White, Buff, and Black Wyandottes; Black, Mottled, and White Javas; American Dominiques; and Jersey Blues.

2. **Asiatic Class.**—Light and Dark Brahmas; Buff, Partridge, White, and Black Cochins; Black and White Langshans.

3. **Mediterranean Class.**—Brown, Rose Comb Brown, White, Rose Comb White, Black, Dominique, Buff, and Silver Duckwing Leghorns; Black and White Minorcas; Andalusians; and Black Spanish.

4. **Polish Class.**—White Crested Black, Golden, Silver, White, Bearded Golden, Bearded Silver, Bearded White, and Buff Laced.

5. **Hamburg Class.**—Golden Spangled, Silver Spangled, Golden Penciled, Silver Penciled, White, and Black Hamburgs; Redcaps; Silver and Golden Campines.

6. **French Class.**—Houdans, Crevecoeurs, and La Fleche.

7. **English Class.**—White, Silver Gray, and Colored Dorkings.

Opportunities Afforded by the Dairy.

Dairymen who have town or city milk routes, and market gardeners who retail their produce, have exceptional opportunities for marketing fresh eggs and poultry at the highest prices. They become well acquainted with many of their customers by their daily visits, and they are looked upon as a direct channel of communication between the country and the city.

They should by all means make the most of this advantage, for any class of agricultural producers who can reach the consumer without the intervention of the middleman is indeed fortunate.

8. Game and Game Bantam Class.—Black Breasted Red, Brown Red, Golden Duckwing, Silver Duckwing, Red Pyle, White, Black, and Birchen Games; the same varieties for Game Bantams, Cornish and White Indian Games; Malays and Black Sumatra Games.

9. Bantam Class Other than Game.—Golden and Silver Sebrights; White and Black Rose Comb; Booted White; Buff, Partridge, White, and Black Cochins; Black Tailed, White, and Black Japanese; and White Crested White Polish.

10. Miscellaneous Class.—Russians, Silkies, Sultans, Frizzles, and Rumpless.

For practical purposes the above ten classes may be grouped into four general classes, as follows:

1. **The General Purpose Breeds:** The American class.

2. **The Meat or Table Breeds:** The Asiatic class.

3. **The Egg Breeds:** The Mediterranean class.

4. **The Ornamental Breeds:** The Polish, Exhibition Games, Miscellaneous, and Bantam classes.

Plymouth Rocks. The Plymouth Rock is the most popular of all varieties of poultry as a general purpose fowl. Its medium size, hardy growth and good laying qualities make it a practical fowl for the farm. The Barred variety is the most generally known of the Plymouth Rocks, and its history dates back a little over a quarter of a century. Various bloods

were used in its making, the belief being general that it originally came from a cross between the American Dominique and the Black Java. It has also been shown that the Light Brahma, Dark Brahma, and Pit Game have been used in its making.

The Barred Plymouth-Rock (Figure 1) is of a grayish white color, regularly crossed with parallel bars of blue black running in straight, distinct lines throughout the entire length of the feather, and showing on the down or under color of the feathers.

The barring is somewhat smaller on the hackle and saddle feathers than on other portions of the body. The bird is of medium size, with broad neck, flat at the shoulders; the breast is full and the body broad and compact; medium sized



Figure 1.
Pair of Barred Plymouth Rocks.

wings that fold gracefully, the points being well covered with breast and saddle feathers; a medium sized head, ornamented with upright, bright red comb and wattles; a large, bright eye; and yellow beak, legs and toes, places the picture before us in its entirety. The difference between the Barred and the Pea Comb Barred is that the latter have a small, firm and even pea comb instead of a single comb.

For the farmer or market poultryman they are favorites, being of medium size, well proportioned, with a deep, full breast, making a most admirable bird for market purposes. They are hardy, mature early and make excellent broilers, from eight to twelve weeks old. They are good layers the year around, and in winter they lay exceptionally well. Their eggs are brown in color and average eight to a pound. They are good sitters and excellent mothers.

The Barred Plymouth Rock, besides being a practical fowl, is also one of the most sought after by fanciers. No class is better filled at the average poultry show than is this.

The graceful figure, upright carriage, and active nature endear it to all as a fancier's fowl. There is a fascination in breeding it for plumage—the more regular and even the barring the better.



Figure 2.
Feathers of Barred Plymouth Rocks.

(Figure 2.) It requires much skill to breed for color, and two matings are generally used. An established rule for mating for cockerels is to use a standard color male with a medium dark female, and for pulléts use light male and dark female. The double mating is resorted to by many, yet the writer has seen rare specimens produced from single matings.

The characteristics of the Barred Plymouth Rocks are noticeable in the other varieties of Plymouth Rocks, except that of color. The sides, shape, general outlines, and qualities are the same in the other varieties as in the Barred. The White Plymouth Rock is pure white in plumage throughout, and the Buff variety is a clear buff, uniform in shape, except the tail, which is deep buff or copperish yellow brown. The buff should extend to the under color as much as possible—the deeper the better.

The standard weight of cocks is $9\frac{1}{2}$ pounds; hens, $7\frac{1}{2}$ pounds; cockerels, 8 pounds; and pullets $6\frac{1}{2}$ pounds.



Figure 3.
Silver Laced Wyandotte Cockerel and Hen.

Wyandottes.

The Wyandotte (Figure 3) is another of the general purpose fowls and is rated next to the Plymouth Rock. From the first it sprang into popular favor and has continued so to the present time. Its origin is comparatively recent, dating back less than twenty-five years. It came originally from the Dark Brahma, Silver Spangled Hamburg, and the Breda, a French fowl. Not a few authorities say that the Wyandottes have Cochin blood in them, from the fact that their ancestors produced single combs and feathered legs.



Figure 6.
Pair of White Wyandottes.

For general purposes the Wyandottes have proved a success, being of medium size, weighing on an average a pound less than the Plymouth Rocks, hardy of constitution and prolific layers. They are easily cared for and bear confinement well. For table purposes they are of superior worth; their flesh is sweet, juicy and tender, making them excellent broilers and roasters. As layers they are among the best, averaging from twelve to fourteen dozen a year, and as winter layers they do well under ordinary circumstances. There are five varieties of the Wyandotte breed, and it is only a matter of opinion as regards a choice of the best. The general characteristics are the same in all, the difference in color of plumage being the only distinguishing mark.

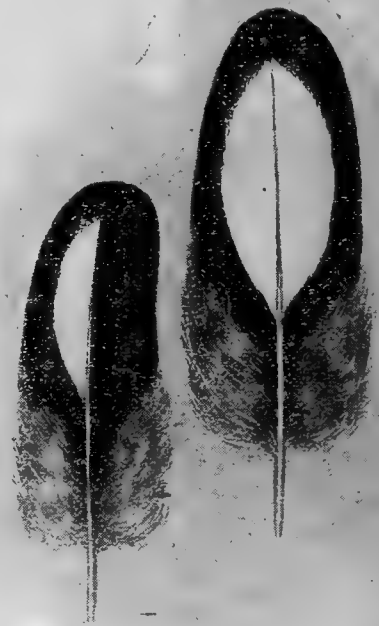


Figure 4.
Feathers of Silver Laced Wyandotte.

The Silver Laced Wyandotte is of a silvery white plumage, with regularly marked white lacing on the breast and a generous distribution of white and black throughout the entire body. The cock has a silver white head, rose comb, silver hackle, with a black stripe down the center of each feather, as shown in Figure 4; silver white back; saddle same as hackle; breast black, with white center (see Figure 4); tail black; wings half black and half white, or, rather, black edged with white; shanks and toes rich yellow, free from feathering. The hen of the Silver Laced variety is marked similarly to the male, except the back and wing, which are whiter in males

than in females. Breast of the female is of much importance in breeding good birds; the lacing should be large and distinct, and the white center of each feather free from black or brown penciling.

The Golden Wyandotte is marked like the Silver, except that the color is golden bay and black instead of white and black. The white variety is perhaps the favorite, from the fact that it is not so difficult to breed to feather, the plumage being pure white throughout. It is for this reason the more practical fowl for the farmer or those who keep poultry for market. The Buff Wyandotte is in color a rich, deep, clear buff, uniform in shape throughout, except the tail, which is of a deeper buff or copperish brown color. Blacks are of a rich, glossy black, with greenish sheen, except breast primaries, secondaries, tail and fluff, which are pure black.

The standard weight of cocks is $8\frac{1}{2}$ pounds; hens, $6\frac{1}{2}$ pounds; cockerels, $7\frac{1}{2}$ pounds; and pullets, $5\frac{1}{2}$ pounds.

Javas.

This variety is the oldest of the American class, and at one time was considered the most profitable of all breeds.

At present Javas are not raised extensively; the more modern or newer breeds have seemingly supplanted them in popularity. There is no reason why this should be so, as they are practical and general purpose fowls. In size they are about like the Plymouth Rocks, but differ in general symmetry and appearance. They are good layers and do well in winter, and for table purposes they make nice eating. They mature early, are good sitters and mothers, and are easily kept in confinement.

There are three varieties of Javas: Black, Mottled, and White. The Black (Figure 7) is more generally seen than the other, though the Mottled has of late years been very numerous represented at the shows.

The plumage of the Blacks is glossy black throughout; the Mottled (Figure 8) is of broken black and white in wings, tail, and sickles, and the balance of the plumage is evenly intermixed with white and black; the White Java is, as the name implies, pure white throughout. It has a small single comb, standing upright on the head in both male and female. The shanks and toes are free from feathers, yellow in color, with the bottom of the feet yellow.

The standard weight of the cocks is $9\frac{1}{2}$ pounds; hens, $7\frac{1}{2}$ pounds; cockerels, 8 pounds; and pullets, $6\frac{1}{2}$ pounds.

Dominiques.

Similarity in plumage of the American Dominique and Barred Plymouth Rock has been the price of the former's popularity. The color is grayish white, each feather regularly crossed with parallel bars of blue black, producing the effect of a bluish tinged plumage, the color being the same throughout. The illustration of Barred Plymouth Rock feathers shown in Figure 2 will do equally as well for the markings of the feathers of the Dominiques. They have rose colored combs, in both males and females, and bright yellow legs. Those who are partial to their color of plumage will find the Dominiques good birds to keep. They are good layers, hardy, mature early, and dress well for the table.

The standard weight of cocks is $8\frac{1}{2}$ pounds; hens, $6\frac{1}{2}$ pounds; cockerels, $7\frac{1}{2}$ pounds; and pullets, $5\frac{1}{2}$ pounds.

The least known variety of the American class is the Jersey Blue. It is one of the largest breeds of poultry, being in size between the Plymouth Rock and the Light Brahma. Their plumage resembles that of the Andalusian, being blue throughout. Their breast and fluff are light blue, hackles and sickles very dark blue, approaching



Figure 7.
Pair of Black Javas.



Figure 8.
Mottled Java Hen.

Jersey Blues.

black, shanks and toes dark blue, the lower surface of toes lighter in shade, and the nails white. They are not as good layers as are the others of their class, but are hardy and easily kept in confinement. They are not popular for table purposes, preference being given to yellow skin and yellow leg birds. The standard weight of cocks is 10 pounds; hens, 8 pounds; cockerels, 7 pounds; pullets, 5 pounds.

The leading variety of the Asiatic class is the Light Brahma (Figure 9). This fowl has a history that would fill pages were it recorded. These are the fowls that caused the hen fever of the Fifties, about which so much has been written in late years. Their early history is a matter of controversy, the best authorities differing as to their origin.

They were first known as the Brahma Pootras, Gray Shanghays, Shittagongs, Cochin Chinas, and what not. The early breeder named them according to his fancy for high sounding and sensational names to sell his stock. Fabulous prices were paid for them when the craze for fine poultry was at its height in the early days of the last half of the Nineteenth Century. The standard of the present Brahmas was fixed in 1869, and no deviation from the type then adopted has been made. They have stood high in popular favor since then without abatement. The vast number of breeders who are raising them fully attest their worth as practical birds to the industry. The Brahma is a characteristic fowl; it is unlike other varieties, and it should not be confounded in shape with the Cochins.

The average Light Brahma male is, in height, 26 inches; back from the ground, 16 inches; keel from the ground, 8 inches; length of body, front of breast to rear of fluff, 14 inches; height of tail, a trifle over 21 inches; saddle hangers to rear of fluff, $2\frac{1}{2}$ inches; eye, from tip of beak, 2 1-6 inches; length of beak and beak, $3\frac{1}{2}$ inches; breast to rear of a drop line from point of beak, $\frac{3}{4}$ to $1\frac{1}{4}$ inches. As specimens depart from this proportion they become awkward and valueless as exhibition stock, and often also as egg producers. In shape, oblong, with full, broad, and round breast carried well forward. The fullness and oblong shape is typical of the Brahma and is characteristic of prolific birds. The curves of the neck and back are similar to those of the outlines of an egg.



Figure 9.
Pair of Light Brahmas.

In plumage the male is pure white, except hackle, tail and flights, which are black and white striped with black. Any other color but white and black is against the standard bred bird. The hackle is white with a black stripe extending down the center of each feather and tapering to a point near the extremity (see Figure 10). The tail feathers are black, and sickles are glossy greenish black.

The shanks are well feathered, with the feathering extending down the middle toe; the toe feathering may be white or white sprinkled with black, pure white preferred. A small pea comb (see Figure 9), broad crown, projects over the eyes; bright red face, wattles and ear lobes are essential to a good head. Shanks and toes are bright yellow. The Brahma female is much like the male in head qualities, having broad comb, projecting well over the eyes, and small pea comb. The head of the female should be masculine in appearance. The head is white; hackle, white striped with black, as in male; cape, white and black, but is completely covered by hackle when the bird stands erect; tail, black, except the two highest main tail feathers, which may be edged with white; tail coverts—one or more rows distinctly covering a part of both sides of the main tail, two rows being preferable—are black edged with white.

The Light Brahmas are valuable birds for the farm. They have always been made to pay for their keep and have seldom been set aside by any who have bred them. They are the largest of domestic poultry and do as well in confinement in small runs as on free range. As layers they will average from twelve to thirteen dozen eggs a year and lay exceptionally well in winter. Their eggs are large, about seven to a pound, of a rich brown color, and excellent flavor. For table purposes the birds are good. They do not mature as early as do the varieties of the American class, yet they are hardy, and can be raised with as much ease as any of the earlier maturing varieties. As sitters and mothers they are fair.

The Dark Brahmans are not so popular as the Light, the difficulty being in breeding them true to feather. Their delicately marked plumage is extremely pretty when bred to standard requirements, but if not so bred it becomes most disagreeable and unsatisfactory to the breeder.

The head and neck of the Dark Brahma male are similar to those of the Light, the head being white and the hackle rather more striped. The back is nearly white, a little black appearing here and there. The black should dominate between the shoulders, but it is nearly hidden by the hackle flowing over it. The saddle feathers are, like the hackle, silvery white, striped with black, which should be distinct. As the feathers approach the tail the stripes become broader till they merge into the tail coverts, which are rich, glossy green black, with a margin or lacing of white. The tail is pure black, with green gloss. The wing coverts are black, forming a distinct black bar across the middle of the wings, while the ends of the secondaries have a large black spot on the end, making the two edges of the wing appear almost black. The remainder of the secondaries is white on the lower half and black on the other. The flights are all black except a narrow fringe of white on the lower edge. The breast is black; the thighs and fluff either black, or black very slightly modeled with white. The shank feathering should correspond with the breast, being black if the latter is black, and slightly modeled with white if not. The shanks are deep yellow, inclining to orange. The color of females is a white ground, closely penciled with dark steel gray, producing a beautiful effect, frosted or silver gray in appearance. There should be no show of pure white in the plumage except in the margins of the hackles. Unless extreme care be taken in mating, the hens are likely to have dingy color, and the pullets are apt to have necks almost white for some distance down. These light neck birds generally breed to worse, but the evil may be remedied by choosing birds for breeding whose heads are distinctly marked. The shape and character of the markings of the Dark Brahma pullets also vary.

They should be medium sized, so that the pencilings can be clearly discerned at a short distance. A great point with regard to color and marking in Brahma pullets is that they should be uniform over the body, and the hackle should be silvery white, heavily striped with rich black, and the shank feathering penciled same as body.

For practical purposes the Dark Brahmans are not to be commended as highly as the Light. The close breeding for points in feathers is likely to interfere with their productiveness, yet with proper attention and care they can be bred profitably as well as for their beauty.



Figure 11.
Pair of Buff Cochins.

The standard weight of the Light Brahma cock is 12 pounds; hens, 9½ pounds; cockerels, 10 pounds; and pullets, 8 pounds. The standard weight of Dark Brahma cocks is 11 pounds; hens, 8½ pounds; cockerels, 9 pounds; and pullets, 7 pounds.

The four varieties of Cochins are very popular with breeders. They are second to the Brahmans in meat breeds, weighing but a pound lighter than the Light Brahma. Old and experienced breeders of Cochins are pronounced in praise of their qualities as profitable fowls. They are hardy, good winter layers of rich, brown, medium sized eggs, and fairly good table fowls. The chicks grow well and develop rapidly under proper care.

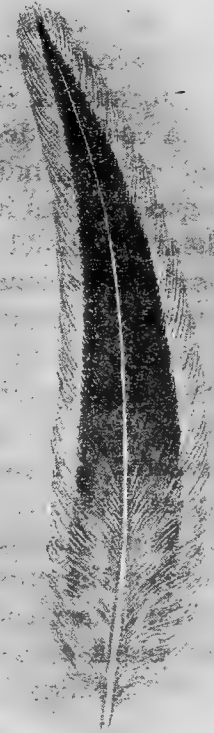


Figure 10.
Hackle Feather of Light Brahma Cock.

The Buff variety (Figure 11) is the most generally bred; the color tone offers an attraction to fanciers that is hard to resist. Both male and female are of a rich, deep, clear buff, uniform in shape throughout, except the tail, which should be a deeper buff or copperish bronze, under color same as surface color, but of lighter shade, and should extend to the skin. In breeding select females as near as possible to the desired shade of buff, as free from dark or white in wing and tail, and of as even a color as can be. To such females mate a cock of deeper shade, with some little black in wing, and tail of deep buff of a coppery luster. This mating will produce good results in cockerels and pullets.

The heavy leg and foot feathering so characteristic of the breed should have constant care and attention. While the feathering should be abundant, all semblance to the vulture hock or stiff feathering should be avoided.

The Partridge Cochin (Figure 13) is a beautiful fowl, yet difficult to breed, and in plumage is much after the pattern of the Dark Brahma, the color being red and brown, instead of the steel gray effect of the latter. The head of male, in color, is bright red; hackle, bright red or orange red, with a distinct black stripe down the center of each feather; saddle feathers, same as hackle; breast and body, rich, deep black; wing bows, red; primaries, black on the inside web, with a bay edging on the outside web; secondaries, black on the inside web and rich bay on the outside web, terminating with greenish black at the end of each feather; wing coverts, greenish black, forming a well defined bar of that color across the wing when folded; tail, black; sickles, coverts, and lesser coverts, glossy greenish black; the latter may be edged with red; thighs, black; shanks, yellow, and well covered with black or brownish feathers; the middle toes being also feathered.

The female is the prettier of the two. The head is small and of a rich, dark brown plumage, with a stout, well curved beak, yellow in color. The eyes are bay and mild in expression. The head is ornamented with a small, single comb, set perfectly straight upon the head and bright red in color. The wattles are small, well rounded and fine in texture. The ear lobes are well developed and are also fine in texture.

The neck is neatly curved, with abundant hackle flowing well over the shoulders. The plumage is bright red or orange red, with a broad black stripe down the middle of each feather. The black stripe in a good feather should run to a point near the end of the feather. This stripe should be free from penciling, but the standard permits a slight penciling of the back. (See Figure 14.)

A good back and cushion help to make the bird. The back should be broad and flat, the broader the better, and the cushion should rise with a gentle convex curve and partially cover the tail. The plumage of the back and cushion is a reddish brown in color. Each feather is penciled with a darker brown; the outlines of the penciling conform to the shape of the feathers. The breast is one of the most important points of a good hen, and should be broad and massive. The

plumage is of the same reddish brown color as the back. The penciling on the breast is perhaps a little more distinct and open than on the back; the outlines of the penciling should be sharp and conform to the shape of the feather.



Figure 12.
Back View of Buff Cochin Cock, Showing
Full Feathering



Figure 13.
Partridge Cochin Hen.

The body is broad and deep behind and of the same plumage as the breast. The fluff is very abundant, covering the posterior portion of the bird and standing out about the sides. The wings are small and the primaries fold closely under the secondaries; the bows are covered by the breast feathers and the fluff conceals the points. The primaries are very dark brown or blackish brown in color; the inner web of the secondaries is a blackish brown and the outer web is a blackish brown penciled with a lighter brown. The coverts are similar in color and penciling to the plumage of the breast.

The tail is small and short, is carried almost horizontally, and is partly concealed by the cushion. In color it is black, except the two main tail feathers, which are penciled. The tail coverts are penciled same as breast and body. Thighs are large and well covered with soft feathers; the feathers on the lower part curve inward around the hock and hide the joint on the outside. The feathering of the thighs is of the same shade and color as that of the body. Shanks are soft and yellow, and heavily covered with feathers of same color as thighs. The toes are well spread and yellow, the outer and middle toes being feathered throughout their entire length.

Black Cochins (Figure 15) are much more easily raised than either of the varieties thus far described. Being of one color, the care bestowed in breeding party colored or penciled birds is not necessary, and the time may be spent in furthering their general utility in egg production. A one colored bird is the more practical bird for the farmer and market poultryman. The Black Cochin is of a rich, glossy black plumage throughout. The White Cochin is pure white in plumage.

The standard weight of Buff, Partridge and White Cochin cocks is 11 pounds; hens, 8½ pounds; cockerels, 9 pounds; and pullets, 7 pounds. Black Cochins are of the same weight, except cocks, which should weigh 10½ pounds.



Figure 15.
Pair of Black Cochins.

others are yellow skinned and yellow legged. The quality of the flesh of the Langshan is excellent, being fine grained, tender, and nicely flavored. As layers they rank among the best, averaging from twelve to thirteen dozen a year, and as winter layers they are to be recommended. The chicks are hardy and mature early. Langshans are good sitters and mothers, being of gentle disposition; they are easily kept, either in confinement or on free range. Being excellent foragers, they are ideal fowls for the farm, and will gather during the year a considerable portion of their feed.

The Langshan is a stylish, medium sized bird, not overgrown or bulky in appearance, of active nature and lively disposition. Many confound the Black Langshan with the Black Cochin.

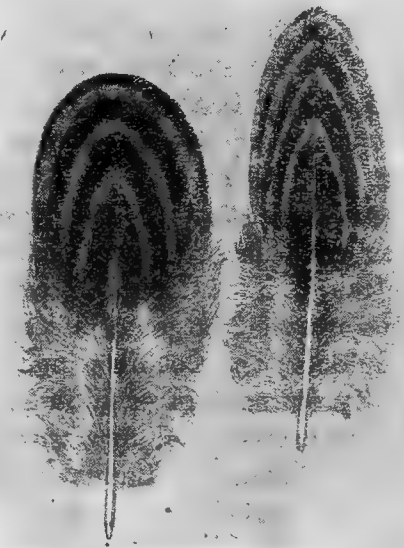


Figure 14.
Feathers of Partridge Cochin Hen.

Langshans.

Langshans are the smallest and most active of the Asiatic class. They are practical in more senses than one, and their prolific laying and other excellent qualities make them profitable for the farmer and market poultryman. They constitute one of the oldest breeds of poultry and have always been held in popular esteem. The shape of the Langshan is distinct from that of the Brahma or Cochin, and should not be confused with either of the last named breeds. Figure 16 shows the accepted contour of the Langshans, and a comparison with the birds in Figures 9 and 11 shows at a glance the characteristics of the Langshans as compared with the other Asiatics. Langshans have white flesh and dark legs, while the

This need not be, as the following comparison between the two varieties shows: The Black Cochin is square in shape, with heavy looking neck and legs, plenty of fluff and leg feathering, cushion rising from middle of back to tail, tail short, small, and almost concealed by cushion; neck, breast, cushion, and tail all represented by convex lines. Langshan head small for size of body, comb medium sized, well up in front, and arched shaped; Cochin head larger than that of the Langshan and not so arched over the eye; comb smaller, low in front, and almost straight on top of serrations. Langshan back short and concave; that of the Cochin medium length, slightly convex, and large convex cushion. Langshan fluff moderate and close; that of Cochin extremely full and loose. Langshan wings somewhat large and inclined downward, quite prominent at shoulders; the Cochin wings smaller and almost hidden by the fluffy plumage of cushion and fluff. Langshan breast full, deep, and carried well forward; Cochin breast not so full and deep, but broader. Langshan legs medium in length, small bone, long, tapering toes, color of shank, bluish black, showing pink between scales, which are nearly black; Cochin legs shorter, stouter, larger bone, toes shorter and stouter, color of shanks, black or yellowish black.

There are two varieties of Langshans, the Black and the White. The Black, in the plumage of neck, back, saddle, sickles, a glossy metallic black, with greenish sheen; breast, primaries, secondaries, tail, fluff, shank, and toe feathers, black. The under color is black or dark slate. The White Langshan is pure white throughout.

The standard weight of cocks for both varieties is 10 pounds; hens, 7 pounds; cockerels, 8 pounds; and pullets, 6 pounds.

Leghorns. Leghorns are the best known of the egg producing varieties of the Mediterranean class. They are the premiers in laying and the standard by which the prolificacy of other breeds is judged. As to the origin of the Leghorns, there are differences of opinion, and there is but little information to be found anywhere concerning their early history. It is generally conceded that a race of fowls bearing a close resemblance in many respects to the Leghorn has existed in Italy and other parts of Europe for a long period. That this race has been widely disseminated admits also of little doubt, inasmuch as at the present day it is known in Denmark and other countries as the Italian. There seems to be good ground for the statement that Leghorns were first introduced into America from Italy. The story goes that as early as 1834 a vessel from Leghorn brought to this country as a part of its cargo a small shipment of fowls, which were at once named Leghorns. They immediately became popular, their prolific laying and nonsitting qualities being recognized at this early date.

White and Brown Leghorns were the first varieties known. Modern breeders are responsible for some of the subvarieties of the breed; and, in point of color at least, exhibition birds of today, even of the older varieties, vary considerably from those seen at the present time in Italy.

The Leghorn fowl holds the same place among poultry that the Jersey holds among cattle. The question of profit in poultry has been decided in favor of egg producing breeds. Leghorns are lively, active, and of a restless disposition, the best of foragers, and will pick up a good part of their living during the year. They are light eaters and the cost of raising them to maturity is about one-half that of the Asiatic varieties. They mature early, feather quickly, the pullets often begin to lay when four months old, and cockerels crow at the same age. They are the best layers, averaging between 150 and 200 eggs per year. Their eggs are pure white in color, and weigh about ten to the pound. As table fowls they are fairly good. By many they are considered excellent. The only thing that can be said against them is that they are small in size. Altogether, they are one of the most profitable breeds of poultry that can



Figure 16.
Pair of Black Langshans.

be kept upon the farm, and the cheapness of their keeping will allow the raising of two Leghorns for the cost of one Asiatic. They must be warmly housed in winter to lay well and to protect their pendulous wattles from frost bite.



Figure 17. Single Comb White Leghorn Cock.

In shape a Leghorn cock (Figure 17) should be graceful; body round and plump, broad at the shoulders, and tapering toward the tail. The tail should be well balanced on a fair length of shank and thigh, the length of leg giving the bird its sprightly and proud carriage. Closeness of feathering adds to the general shape and secures a freedom from angles which always proclaims the pure bred, typical specimen. The breast should be full, beautifully curved, rather prominent, and carried well forward. Neck long, well arched, and carried erect; back of medium length, with saddle rising in a sharp concave sweep to the tail; tail large, full, carried upright; the full, flowing tail and long, well curved sickles are characteristics of the birds most thought of. The wing is long, well folded, and tightly carried. Hackle and saddle feathers long and abundant, and flowing well over the shoulder and saddle. The legs are bright yellow and free from feathers; toes also yellow, but a dark shade is allowable. The head is the prettiest portion of the bird, being short and deep; yellow beak, full, bright red eyes, and bright red face. The comb is single, of medium size, perfectly straight and

upright upon the head, free from side sprigs, deeply serrated with five or six points, and bright red. The comb should extend well back over the head, with no tendency to follow the shape of the neck. Ear lobes are white or creamy white.

The Leghorn hen in many respects resembles the cock, except in the carriage of comb and sexual differences. In shape and carriage the hen is even more graceful and sprightly than the cock, very close in feather, and rather small in body, though somewhat long in back. Her breast is full, very round, and carried high; legs fairly long, and shanks thin; tail carried closely and well up. The general carriage should be upright. Her comb is the marvel of her beauty; it is single and falls gracefully to one side but not in a limp manner, or so as to obscure the sight. Figure 18 shows an ideal comb of Leghorn female. Legs, comb, and face are the same color as in the male, but the ear lobe is much smaller.

There are six standard varieties of Leghorns: Black, Brown, Buff, Dominique, Silver Duckwing, and White.

The Black Leghorn is a popular bird, and a favorite with those who are partial to its color of plumage. The Black Leghorn is mistaken by many for the Black Minorca, but it is quite different in type. The Minorca is larger in size, has a longer body, larger comb, and dark slate or nearly black shanks and toes. The plumage of the Black Leghorn is a rich, glossy black throughout. Comb, face and wattles bright red; ear lobes white; and shank yellow, or yellowish black.



Figure 18. Head of Single Comb Brown Leghorn Hen.



Figure 19. Head of Single Comb Brown Leghorn Cock.

Comb, face and wattles bright red; ear lobes white; and shank yellow, or yellowish black.

The Brown Leghorns (Figure 20) are one of the prettiest, as well as the most commonly bred, of the Leghorn varieties. They are the most difficult of all to breed to feather.

They have merited the confidence of poultry lovers for a long time and their hardy constitutions have thwarted rough usage and promiscuous interbreeding to efface their characteristics. They are a fixed breed and their merits are noticeable from the newly hatched chick to the oldest specimen; they are stamped with the indelible mark of royalty only to be found in a thoroughbred.



Figure 20.
Single Comb Brown Leghorn Cock.

In mating Brown Leghorns opposites must be considered. Should the male be fine in all points except comb or leg, select females strong in this point to mate with him. The most successful breeders use a double mating, one pen to produce exhibition birds of each sex. Fine birds, both cockerels and pullets, can be bred from the same pen by using slightly different types of females. The same male often will breed the finest of both exhibition cockerels and pullets, but it is a rare case to have a female breed both sexes of a remarkable quality.

When two pens are used, at the head of the pen mated to produce the cockerels place a fully developed cock with no serious fault, standard color, especially strong in comb, lobe, hackle, and saddle, a dark undercolor preferred. To him mate hens of a shade darker than standard, standing combs; a trifle brick color on wings is no objection, as it will give a brighter color on wing bows of the cockerels. Shafting on the back will also help the black stripe in the saddles. The pullets raised from this pen will be too dark for exhibition, but they will be a great help for breeding cockerels the next season. The male at

the head of the pen mated to produce the pullets should be from a pullet strain, and bred directly from an exhibition hen. His color should be a trifle light; comb large, but evenly serrated, if thin near the top, all the better; hackle well striped (see Figure 21), but none in saddle; under color of saddle or hackle may be light gray or white; wing bows should show more purple than red, as too much red shows signs of being bred from a bricky hen. To him mate exhibition females having light brown, penciled with darker brown on back and wings, all one shade, free from shafting on back and brick color on wings. These hens should have a large comb, lying over, but firm and strong on the head, so it does not lie close to the eye and face. The cockerels raised from this mating are the birds to use for breeding females the next year. By breeding Brown Leghorns in this manner we have two distinct lines of blood, and they should never be crossed.

The Buff Leghorn (Figure 22) is the most recent acquisition to the Mediterranean class. It is a beautiful bird and one that will win its way wherever bred. Buff colored birds have many admirers, and those who have bred them are pronounced in their praise of their qualities. Besides having the general characteristics of the Leghorn type, the Buff Leghorn cock has rich buff colored hackle and saddle, in shade from lemon to cinnamon, but of even, solid color, in keeping with the rest of the plumage; the back and the wing bow exactly match the plumage; tail of the same general tint, but richer, deeper buff is preferable; the standard given for tail is a rich, deep buff of copperish bronze. The remainder of the plumage is of slightly lighter shade, but even in color throughout, with no semblance of a patchy or mottled plumage. White and black feathers in



Figure 21. Feathers of Brown Leghorns.

plumage are objectionable; solid white or solid black feathers will disqualify the bird. The hen is of the same color as the cock.

Dominique Leghorns are not so generally known. Their color is much like that of the American Dominique and Barred Plymouth Rock, and is what is known as Cucko by English breeders. The body color is grayish white, each feather regularly crossed with parallel bars of blue black, producing the effect of a bluish tinged plumage. This color is the same throughout. The ground color of each feather is a clear, light bluish gray. The shanks and toes are bright yellow and eyes bright red.

Silver Duckwing Leghorns are not generally bred in this country, though they are frequently seen in the show rooms. They are considered as profitable as any of the older Leghorn varieties, and in point of beauty they are interesting and fascinating. They take the name Duckwing from the similarity of the steel blue wing bar to that of the Mallard or wild duck, the name being first given to a variety of games—the Silver Duckwing Game. The hackle and saddle feathers of a Silver Duckwing Leghorn cock are pure silvery white, without the slightest straw or creamy tinge, with a narrow black stripe along the center of the lower hackle feathers. Back, saddle, wing bow and wing bay, pure white; breast, under parts, wing bar, and tail, dense, lustrous black. The Silver Duckwing Leghorn hen has a silvery gray hackle, with a narrow black stripe through the center of each feather. The breast is light salmon, shading off to gray toward the sides. The body color, when viewed at a short distance, should appear gray, with a faint bluish tint all over. A tendency

to ruddy gray, either in ground color or penciling, is objectionable. The tail is black or dark brown, except the two upper feathers, which are light gray. The penciling or marking is irregular or wavy.

The White Leghorn, like the Brown, is one of the most generally bred of the Leghorn varieties. It is, no doubt, the most advantageous to breed for profit, and the easiest to raise on the farm. Being of one color in plumage, these birds are more successfully raised and cared for than the pure colored varieties. Their plumage is pure white throughout, and feathers other than white will disqualify them. It has been a matter of much speculation as to which variety of Leghorn is most prolific in egg production. This is a difficult question to adjust properly to the satisfaction of the specialty breeders, but from a conservative standpoint it is generally considered that the Whites have slightly the advantage over the others. Phenomenal individual egg records have been made by almost all varieties, but the above opinion is advanced from the general results obtained from various sources.

There are subvarieties both in Brown and White Leghorns—the Rose Comb Brown and the Rose Comb White. The only distinguishing difference between the last named and the other varieties is the comb. The Rose Comb White and Rose Comb Brown Leghorns have a small rose comb (see Figure 23), square in front, firm and even upon the head, tapering evenly from front to rear, without inclining to one side, the top comparatively flat and covered with small points, or corrugations, terminating in a well developed spike in the rear. There is no standard weight given in Leghorns.

The Minorcas belong to the Mediterranean

Minorcas. class, and they are placed next to the Leghorn in laying qualities. They are in appearance very similar to the Leghorns. Their general outline is, in fact, that of the latter, but of more length of body and heavier in mold. Indeed, they are the only variety of the Mediterranean class that has a given weight which approaches that of the Wyandotte,



Figure 22. Leghorn Cockerel.



Figure 23. Rose Comb White Leghorn Cockerel.

being only $\frac{1}{2}$ pound lighter. The origin of the Minorcas, like that of so many others of our profitable poultry, is much in doubt. Some are of the opinion that they originally came from Minorca, one of the Balearic Isles, in the Mediterranean Sea, while others contend that they are a variety of the Black Spanish. Be that as it may, they are one of the most profitable breeds of poultry for the farm.

The Minorcas are good for table purposes, the flesh being white, of light color, and fine grained. Their chief advantage is their egg production. They are nonsitters and year around layers. As winter layers they are exceptionally good, when kept under fairly favorable circumstances. While the Leghorns surpass them in the number of eggs laid, the Minorcas' eggs are larger and equal the output in bulk. Their eggs are white and average eight to the pound. They lay from twelve to fifteen dozen a year. Being of an active, restless disposition, they keep in splendid condition and make good foragers. For suburban poultry keeping they are very practical birds, and net good results to the keeper. They are hardy, easily raised, and mature quickly.

The Minorca fowl is large in outline, good body; stands well upon its legs, has a broad chest and a long, flat back, with tail carried upright. Many breeders dispute as to the carriage of the tail. The standard says upright, while the preference is almost universally expressed by breeders that it should be carried well back. The upright position gives the tail the Leghorn type (see Figure 17), while the typical Minorca differs somewhat from it, being more horizontal, as shown in Figure 24. The body of the Minorca male is long, square in front, tapering from front to rear. When standing erect the body of the male is at an angle of nearly 45 degrees. Thighs are stout; shanks medium in length, stout in bone, and in color dark slate or nearly black; comb single, large, perfectly straight and upright, evenly serrated, and extending well over back of head. The comb of the Minorca is larger and more bulky than that of the Leghorn. Wattles are thin and pendulous, corresponding with size of comb; ear lobes pure white. The female is in body of the same general appearance as the male—rather long, broad and deep. Her comb is single, large and drooping to one side; like comb of male, her comb is perceptibly larger than that of the Leghorn female. Black Minorcas are in plumage a rich, glossy black throughout, and gray tips are considered serious defects. The White Minorca is as popular as the Black, and takes the same position as does the White Leghorn in its class. The standard qualifications are equal for the two except in color, and that must be pure white throughout; feathers other than white disqualifying. The other qualities are equal as to profitableness between the two varieties. The comb, face and wattles are bright red, free from white in face. Eyes are dark hazel or red.



Figure 24. Black Minorca Cockerel.

Before concluding with regard to the Minorcas it is worthy of note that the latest acquisition to the breed is the Rose Comb Black Minorca. The only objection that has ever been raised against the varieties of the Mediterranean class is their susceptibility to frost bite of the comb. Their combs are so large that continued cold or exposure is sure to result in this injury. To obviate this one defect, if it may be so termed, in this valuable class of birds, has been the purpose of breeders in producing a bird that possesses the other qualifications and with low rose comb. There are two standard varieties of Minorcas—the Black and the White. The Rose Comb Black Minorca is not recognized as a standard variety as yet, but indications point to its admission as such in the near future. Many good specimens have been bred and exhibited at the recent shows; and success in making this variety seems assured. The head of the Rose Comb Black Minorca male should be medium in length; beak, stout and black; eyes, dark red; face, smooth and red; comb, rose, straight, and set close and even on the head. In size the comb should be between that of the Wyandotte and the Leghorn; wattles, medium in length and not so large as in single comb varieties; ear lobes, pure white, large, smooth and almond shaped. The head of female is similar to that of the male, medium in size; face, red; comb, small and even on the head; wattles, medium in size, thin and bright red; ear lobes, pure white, large and even.

The standard weight of the Minorca cock is 8 pounds; hen, 6½ pounds; cockerel, 6½ pounds; and pullet, 5½ pounds.

Andalusians.

The Andalusian (Figure 25) is one of the prettiest of the feathered race, being of a beautiful light and dark blue plumage. It is called the Blue Andalusian and it is the only variety of its breed. It is not so popular in this country as it should be, owing to the sentiment against white skin and blue shanks. English and French poultrymen

prefer these qualities in a bird, and with them it is very popular. The hens are nonsitters and splendid layers of large white eggs, equaling in size those of the Minorcas. Specimens of their eggs have been in competition and won the award for merit in size and weight. The chicks are hardy, mature early, and the pullets begin laying when five or six months old.

For farm purposes they rank with the Leghorn and the Minorca, the preference being only in the color of their plumage. For fancy purposes they are an ideal bird on account of their beauty. Their general characteristics are those of the Leghorn. The hackle and saddle feathers are dark blue, approaching black; breast, a lighter shade of blue, each feather having a well defined lacing of a darker shade; body and fluff, similar in color to breast, but somewhat darker; primaries, light blue; secondaries and wing coverts, dark blue; wing bows, darker blue, approaching black; tail and sickle feathers, dark blue, approaching black; shanks and toes, slaty blue.



Figure 25.
Blue Andalusian Hen.

No standard weight is given for Andalusians; their average size is that of the Leghorn.

Black Spanish.

The Black Spanish fowls (Figure 26) constitute one of the oldest varieties of domestic poultry. Their name has been identified with the industry for hundreds of years, and their practical worth on the farm has long been recognized. Their haughty bearing, large red comb and wattles, and the white face and lobes peculiar to the breed, contrasting with their glossy black plumage, render them striking birds.

White Faced Black Spanish have long been favorably known for their exceptional laying qualities. The oldest of the nonsitting varieties, they still maintain an unsurpassed record. The pullets are early layers, averaging 150 to 180 eggs per year; the hens begin somewhat later, after molting, but compensate for any loss in number by the increased size of the eggs. Hens and pullets alike are well above the average for winter laying. Their eggs are large and white and of good flavor. The white face is a distinguishing feature, and should be long, smooth, free from wrinkles, rising well over the eyes in an arched form, extending toward the back of the head and to the base of the beak, covering the cheeks and joining the wattles at ear lobes; the greater the depth of surface the better. It should be pure white in color. The color of plumage throughout is rich, glossy black, and any gray is considered a serious defect. Shanks and toes are blue, or dark leaden blue. Comb is single and bright red in color; wattles, bright red, except the inside of the upper part, which is white; ear lobes, pure white.

No standard weight is given for Black Spanish; they equal in size the Leghorns and Andalusians.

White Crested Black Polish.

One of the oldest varieties of poultry is the Polish (Figure 27), its ancestors being traced as far back as the Sixteenth Century. Among the varieties mentioned in those early days was the Woolly fowl, similar to the Silky fowl of today. Mention in history is also made of the Frizzled fowl, the Persian fowl, the Turkish fowl, and the Crested fowl. The latter is described as being a fowl with a lark's crest. Another



Figure 26.
Pair of White Faced Black Spanish.

variety is known as the Patavinian fowl, which is believed to be the progenitor of the Polish variety. The cock is described as exceedingly beautiful, being richly decorated with five colors, black, white, green, red, and ocher; the body is black, the neck covered with white feathers, and the wings and back partly black, and partly green; the tail is the same, but the roots of the feathers are whitish, and some of the flight feathers are also white.



Figure 27.
Pair of White Crested Black Polish.

The eyes are surrounded with red circles, the comb is very small, the bill and feet yellow, and the head is adorned with a beautiful crest. In the hen there is no white except the white pellicle at the opening of the ears. She is altogether of a greenish black color, with yellow feet and a very small comb, slightly tinged with red.

The general characteristics of the Polish are those of medium sized fowls, slightly larger than the Hamburgs; a full, round breast, carried well forward; the neck of the cock carried back and beautifully arched; a perfectly straight back, broad at the shoulders and narrowing rapidly to the tail; large and closely folded wings; a large, well expanded, upright tail, and in the cock furnished with an abundance of tail coverts and sickle feathers; shanks of a bluish color, in all varieties but the White Crested Black, in which they are of dark slate or nearly black; and, above all, a large crest and leaf comb. The crest of the cock is composed of narrow feathers, something like those which form the hackle of the neck and saddle. They should rise well in front, so as not to obstruct the sight, and fall over to the back and sides in a flowing, even mass. If they fall forward, as is sometimes the case, they both obstruct the sight and are liable to get wet when the bird drinks. Such a crest, also, is hollow in the center and loses much of its beauty. The crest of the hen is formed of feathers growing upward and turning in at the extremities, and should be large and globular in form and compact in character, with no sign of parting. The larger the crest the better, provided it is of good shape; but a close, compact, well formed crest is to be preferred to one that is larger, but of loose texture and falling in all directions. The comb is peculiar, and belongs to the class of combs which have a fancied resemblance to a leaf, and are designated leaf combs. It is better described, however, as two fleshy horns diverting like the letter V, the upper extremities retreating into the crest. The smaller the comb the better, and if wholly wanting, except when removed by design or accident, it is not regarded as a disqualification.

Polish chickens are bred extensively in this country and by some are considered practical for general purposes, but, while some breeders may secure good results, the Polish is not to be fully recommended as a general purpose fowl. They are considered more as fancy birds, and are generally bred for pleasure and the show room. Their large crest is against them, hindering their vision and causing them to become listless, inactive, and suspicious. Extra care must be given to be fairly successful in raising them, and their houses and coops must be kept absolutely dry—the least water in their crest is likely to prove fatal to them. They are fairly good layers of medium sized eggs, and are nonsitters. For table purposes they are considered good, their flesh being fine grained, tender, and sweet.

Of the varieties of Polish, the White Crested Black is the most popular. The color of their plumage is a rich, glossy black throughout, with the exception of the crest, which is pure white. The shanks and toes are black, or dark slate; comb and wattles are bright red and ear lobes are white.

The Golden and Silver varieties are beautifully marked in plumage. In the Golden the feathers are marked with rich golden bay and spangled or laced with black. The feathers of the Silver are



Figure 28.
Bearded Silver Polish Hen.

silvery white, instead of the golden bay, and spangled or laced with black. The illustration (Figure 28) shows the general markings of the feathers. The White Polish is pure white throughout the plumage.

There are two distinct subbreeds of Polish, the Plain and the Bearded. The latter has a thick, full beard, running back of the eye in a handsome curve, and in color corresponding with the balance of the plumage. The egg varieties of Polish are: White Crested Black, Golden, Silver, White, Bearded Golden, Bearded Silver, Bearded White, and Buff Laced.

No standard weight is given for Polish; they are of medium size, about that of the Leghorns.



Figure 29. Pair of Silver Spangled Hamburgs.

Hamburgs.

Hamburgs (Figures 29 and 30) are in the front ranks of egg producers and are in general appearance much like Leghorns. There are six varieties of Hamburgs: the Golden Spangled, Silver Spangled, Golden Penciled, Silver Penciled, Black, and White. They are all very pretty birds and seldom fail to prove attractive and profitable to the average breeder and fancier. Hamburgs are economical fowls to keep; besides

being light eaters and great foragers, they are prolific layers and nonsitters. The only thing against them is the smallness of their eggs. They lay a pretty, white shelled egg, but smaller in size than those of the Leghorn. There are some which lay larger eggs than others, and by careful selection from year to year of the birds which lay the largest eggs this defect may be remedied and the size of the eggs improved.

The Silver Spangled Hamburg is perhaps the most beautiful as well as the most popular variety of the Hamburgs. Its proud carriage, royal decoration and graceful, symmetrical form command attention whenever seen. Breeders of Hamburgs usually adopt the following as a standard for the breed: Comb, square at front, tapering nicely into a long spike, full of points, by no means plain, firmly and evenly set on the head; face, red; ear lobes, moderate in size, round as possible, and clear white; legs, leaden blue; carriage, graceful; plumage, very profuse.

Cocks—Silver Spangled: Color, clear, silvery white ground; every feather tipped or spangled; the breast as bold as possible, but showing the spangle; the bars of the wing regular and bold; neck, back and saddle, nicely tipped; bow well marked (by no means cloudy, brown or brassy); back, as green as possible. Gold Spangled: Color, very black and rich ground; the back, glossy green; the neck and saddle nicely striped; bow of wing well marked. Hens—Silver Spangled: The white, clear and silvery; spangles, large, green as possible, distinct and clear. Gold Spangled: Ground, clear, rich; clear spangles, large and distinct.

The feather markings of the penciled varieties differ greatly from those of the spangled; the latter being commonly called moon eye, from the round or open appearance of the spangles, while the markings of the penciled varieties are in parallel bars of reddish bay or black, or clear, silvery white and black, as the case may be. White and Black Hamburgs are solid white or solid black in plumage.

No standard weight is given for Hamburgs.



Figure 30. Black Hamburg Hen.

Redcaps.

This variety (Figure 31) is the largest of the Hamburg group, its size equaling that of the Minorca. Redcaps are an old breed, mention of them being made by some of the old authors. They are not so popular as the Hamburgs, there being difficulty in breeding them with good combs and clearly defined plumage. The large comb stands in their way as popular birds, and unless it is square and even it makes a miserable sight.



Figure 31. Head of Redcap Cock.

Redcaps are hardy and mature early, and, like Hamburgs, are excellent layers. For market purposes they are good, the size and quality of flesh being recommendations for popular favor. They are reputed to be nonsitters, though occasionally they are known to sit and hatch broods.

The comb is rose, the larger the better, not overhanging the eyes, square in front and uniform on each side. It must be firm and even upon the head, without inclining to one side, the top covered with small points, or corrugations, terminating at the rear in a well developed, straight spike, and bright red in color. Wattles and ear lobes are also bright red. In plumage the male and female are red and black; the head is red, with blue black hackle, each feather edged with red; the back is red and black, and breast purplish black. The shanks are slate colored.

The standard weight of cocks is $7\frac{1}{2}$ pounds; hens, $6\frac{1}{2}$ pounds; cockerels, 6 pounds; and pullets, 5 pounds.

Campines.

Campines belong to the Hamburg group. They are an old variety, but have only recently been admitted to the standard. The first mention of them was made in 1828, when they were referred to as a small variety of fowls imported from Holland, called Everyday Hens, or Everlasting Layers. This name is still applied to them on their native soil. Campines are rated as extraordinary layers in Holland, their native country, but their introduction into this country has been so recent that a comparison with the other egg laying breeds cannot be satisfactorily estimated. However, those who keep them speak highly of their laying qualities.

They much resemble the Hamburgs, so much so that many think they are the same breed of birds. They differ, however, from the Hamburgs in the comb, having a single comb, while the comb of the Hamburg is rose. There are two varieties of Campines, the Golden and the Silver. The color of the Golden is a rich golden bay in the neck plumage and a darker yellow for the body color. The Silver Campines are silvery white and black throughout their plumage. The shanks and toes of both varieties are dark blue in color; wattles, bright red; and ear lobes, white or bluish white.

No standard weight is given for Campines; they equal the Hamburgs in size.

Houdans.

The three varieties of poultry in the French class are the Houdans, Creve-coeurs and La Fleches. Of these the Houdans (Figure 32) are considered to be the most popular and profitable, being bred to a great extent throughout the entire country. They are hardy and prolific layers of large, white eggs. For table purposes they are among the best fowls. They have small bones and the flesh is tender and delicious. The chicks are



Figure 32. Pair of Houdans.

sprightly and active and feather rapidly. They are nonsitters and light feeders; like the Leghorns, they may be fed at small cost as compared with some of the larger breeds. They are of medium size and of a model white plumage, black and white intermixed, the black slightly predominating; wing bars and secondaries, black; primaries, black and white intermixed. Houdans are a crested variety, having a leaf comb shaped somewhat like the letter V, which rests against the crest; crest of cock is large, well fitted upon the crown of the head, falling backward upon the neck, and composed of feathers similar in shape and texture to those of the hackle. The crest of the female is large, compact and regular, inclining backward in an unbroken mass. A peculiarity of the breed is their having five toes, like the Dorkings; shanks and toes are of a pinkish white color.

The standard weight of cocks is 7 pounds; hens, 6 pounds; cockerels, 6 pounds; and pullets, 5 pounds.

Crevecoeurs.

This variety is not so generally known in this country as the Houdans, but in France, their native country, they are bred extensively for market purposes.

They are considered of superior quality for the table, their flesh being white and delicately flavored. They are of gentle disposition and do well in confinement. They have weak constitutions and require extra care and attention. As layers they are only fair, and are nonsitters. They are a crested variety, having comb and crest similar to the Houdans, and in plumage are a rich, greenish black throughout.

The standard weight of cocks is 8 pounds; hens, 7 pounds; cockerels, 7 pounds; and pullets, 6 pounds.

La Fleches.

La Fleche fowls differ in character from the other two breeds of French poultry mentioned. Houdans and Crevecoeurs are more compactly built than La Fleches, the latter being tall and rather gaunt looking, and in style and character denote the preponderance of Spanish blood. Their plumage is a rich, glossy black throughout. The comb is peculiar to itself, being leaf, of moderate size, branching and antler like, somewhat like two horns pointing upward. The birds are of extremely delicate constitution, and difficult to raise. The flesh is more delicate and juicy than any variety except the Game. It is a moderate layer of very large, white eggs, but by no means so good as the Spanish in this respect. As a table fowl it claims superiority; but it does not mature early—not nearly so early as the Houdans or the Crevecoeurs.

The standard weight of cocks is 8½ pounds; hens, 7½ pounds; cockerels, 7½ pounds; and pullets, 6½ pounds.

Dorkings.

This English fowl may be considered an ideal bird for general purposes. It is hardy and can stand almost any amount

of cold weather, provided the ground is not damp. This is proved by the fact that it does well in the southern part of Scotland and in the extreme north of Ireland, among the Cumberland Hills, and the other places equally cold and exposed. It should be remembered by those who contemplate raising this kind that the soil must not be damp if success is expected. The Dorking (Figure 33) is one of the oldest of domestic fowls, if not the oldest. There are no definite records to show when it first lived in England, or whence it came, but the supposition is that it was carried to England by the Romans, who evidently possessed chickens of similar characteristics.



Figure 33. Silver Gray Dorking Cock.

The chief distinctive mark of the breed is the presence of a fifth or supernumerary toe, springing behind a little above the foot and below the spur. It has been sought by various writers to deprive Dorking of the honor of being the original and principal rearing place of this justly celebrated variety; and it is asserted that the true Dorking fowls are raised at Horsham, Cockfield, and other places in the Weld of Syria, and that the ancient and superior white fowls from Dorking are a degenerated race compared with the improved Sussex breed. The feature in which this bird is most popular is its table qualities. The flesh is white and very delicate in texture. It is claimed by many to equal if not excel the French varieties. The broad, deep and projecting breast

of the Dorking admirably fits it for table purposes, and in this respect it is conceded by some to rival the Indian Game. As layers the Dorkings are good, and are careful sitters and attentive mothers. They are profitable and splendid fowls for the farm.

There are three varieties of Dorkings—the White, Silver Gray, and Colored. The White Dorking is really the purest blooded of the three, as for years this was the only variety which produced invariably the fifth toe, although the Colored and Silver Gray varieties seldom fail to breed this peculiarity. In color the White Dorking is a clear, unblemished, glossy white. The comb and wattles are a bright scarred red; the legs are either white or of a delicate flesh color.

Silver Gray Dorkings are beautiful in plumage. The head of the cock is silvery white; hackle, silvery white, as free from stripes as possible; comb, face, ear lobes and wattles, bright red; beak, horn color or white; eyes, orange. Breast, thigh and other parts, black; back, shoulder coverts, saddle and wing bow, pure silvery white; coverts, greenish black; primaries, black, edged with white; secondaries, part of outer web forming a wing bay, white; remainder of feathers forming wing butt, black; tail, greenish, glossy black; legs, feet and toe nails, white. The eye, beak, comb, face, wattles, legs, feet and toe nails of the hen are the same as in the cock; head, silvery white, with slight gray markings; hackle, silvery white, clearly striped with black; breast, rich robin red or salmon red, shaded off to gray in the lower parts; back, shoulder coverts, saddle, wing bow and wing coverts, bright silver gray, with minute pencilings of darker gray on each feather; the shafts of the feathers, white; primaries, gray or black; secondaries, gray; tail, gray, of a darker shade than body; quill feathers, black.

Colored Dorkings differ from the others only in color, the general color of the male being black and straw color, while the female is marked with black and mixed gray, with breast of dark salmon, edged with black. The combs of the Dorkings differ in the three varieties; the Whites have rose combs, Silver Grays have single combs, and Colored Dorkings may have either single or rose combs, but single are preferred.

The standard weights of Dorkings differ. The weights for Whites are: Cocks, 7½ pounds; hens, 6 pounds; cockerels, 6½ pounds; and pullets, 5 pounds. Silver Grays: Cocks, 8 pounds; hens, 6½ pounds; cockerels, 7 pounds; and pullets, 5½ pounds. Colored: Cocks, 9 pounds; hens, 7 pounds; cockerels, 8 pounds; and pullets, 6 pounds.

The Game fowl is one of the most interesting varieties of domestic poultry. Its origin and history are seemingly linked with all topics concerning poultry and its origin, and even to this day the Game class is looked upon differently from all others. There are two divisions, Pit Games and Exhibition Games, and perhaps three, which are as wholly different in character as though of distinct variety. The Pit Game is not reckoned in the standard varieties of poultry, yet for practical and profitable poultry keeping it surpasses the more pretentious Exhibition Game. The type of the Pit Game is as distinct, thorough, and characteristic as any of the standard games, differing in pluming and feather markings. Color is not considered in breeding Pits; it is muscle, bone, and strength that are sought after, bred for, and that distinguish it from its relative, Exhibition Game. Note the contrast between the two types: The Pit is short, stout, and stocky, with abundant tail feathering; while the Exhibition Game is long, lanky, close feathered throughout, and spare in tail feathering.

For the farm and general purposes the Pit Game has always been considered a practical and profitable fowl. It is hardy, matures early, is a good layer, and fine for table purposes. Its flesh is considered of exceptional value for eating, being fine grained, tender, and sweet. The hens are splendid sitters and careful mothers.

For a long time Exhibition Games have been favorites in this country. By careful selection in breeding for many generations they have been brought to a high state of perfection. The beauty of an Exhibition Game is much praised in this and other countries and the pens are always filled at the shows. They are sought after and courted by fanciers, and as ornamental fowls they have few equals in the number of their admirers. The practical quality of the Exhibition Game has never been demonstrated with accuracy, their tall figure standing

in the way of popularity and general usefulness. It should not be understood that they are unprofitable to keep, but rather not a fowl for farm purposes. They are usually splendid layers and excellent table fowls, their meat being fine grained, tender, and juicy. They are splendid sitters and mothers. Their tall, commanding, and striking figures are decided contrasts to those of other poultry, and afford a diversion to admirers of fine poultry. The varieties of Exhibition Games are: Black Breasted Red, Brown Red, Golden and Silver Duckwing, Red Pyles, White, Black, Birchen, Cornish and White Indian, Malay, and Black Sumatra.

Black Breasted Red Games.

The history of the Black Breasted Red Game dates from the most remote times. They always breed uniformly and invariably alike in color, this uniformity being also observed in the Bantams of the same name. The color of the Red Game Cock is a bright orange; the head, hackle, and saddle being a light red; the breast, body, and stern are black; the shoulders, with the exception of the shoulder coverts, are red; wing bow, red; coverts, black; tail feathers, sickles, and tail coverts, lustrous black; eyes, black; shanks and feet, yellow. The hen is brown; head and hackles, light golden, the hackle feathers being striped with black down the center; the feathers of the body, penciled with black; tail, black or dark brown, the upper feathers being penciled with light brown.

The head of the cock is long, and the neck slim and snaky; breast, broad; great breadth across the shoulders; back, straight and sloping to the tail; body, hard and compact; wings, short; tail, small and closely folded, with few sickles and fine, narrow hangers; thighs, long and well developed; shanks, long, stout and smooth; toes, long and straight. The hen is about the same shape as the cock, and the carriage of both is bold and upright. The Black Breasted Red Game is an excellent table fowl and a moderate layer of medium sized eggs of rich flavor. The chicks require much care, as their constitutions are weakened from too close breeding for ordinary purposes.

Brown Red Games.

The Brown Red Game differs from the Black Breasted Red Game in the color of the head. The face is dark purple; beak, dark brown or black; wattles, comb, and ear lobes, black or dark purple; head of cock, orange; hackle, lemon colored, with a black down the center of each feather; back, lemon; saddle, lemon colored, striped like hackle; breast, black, laced with lemon; shoulders, black; shoulder coverts, lemon; wing bows, lemon, and coverts glossy black; tail, lustrous black; shanks and feet, dark yellow, nearly black.

Golden and Silver Duckwing Games.

The Golden and Silver Duckwing Games are similar in markings, the only difference being that the Silver Duckwing cock (Figure 34) is white where the Golden Duckwing is golden or straw colored. In both varieties the face, comb, wattles, and ear lobes are red; the beak, brown; breast, tail, and thighs, black; shanks and feet, yellow. In the Golden the head of the cock is straw colored; back, golden; wing bow, golden; the wing coverts forming a distinct black bar across the wing. These points are white in the Silver Duckwing.

Red Pyle Games.

The plumage of the head and the hackle of the Red Pyle Game cock (Figure 35) varies from bright orange to chestnut; back, crimson; breast, white, laced with chestnut; body, white; wings, crimson, transversed with a white bar; tail and tail coverts, white; the head of the hen is chestnut; hackle, white, edged with yellow; back, white; breast, salmon; wings, white or chestnut tinged; tail, white; shanks and feet of both cock and hen are yellow or willow. Red Pyles are similar in markings to the Black Breasted Reds, white being substituted for black (Figure 39).



Figure 34. Silver Duckwing Game Cockerel.

White and Black Games.

These two varieties differ only in color from the others of their breed. The plumage of the White Game is a pure, spotless white; beak, shanks, and feet, yellow; comb, wattles, and ear lobes, red. The Black Game is a lustrous black in plumage; beak, shanks, and feet, black; comb, wattles, and ear lobes, deep red.

Birchen Games.

Birchen Games are silvery white and black; head, hackle, back, and saddle of cock are silvery white, with a narrow black stripe in the center of each hackle and saddle feather; black breast, each feather laced with silvery white; wing coverts, glossy black; tail and thighs, black; shanks and feet, dark willow or black; comb, wattles, and ear lobes, dark purple or black. The hen is black, except the hackle, which is silvery white, with a dark stripe down the center of each feather.

Cornish and White Indian Games.

The Indian Game (Figures 36 and 37) has many fine qualities to recommend it to the breeder, and for many years past has been one of the most popular of fowls. In plumage the male is green black without penciling; the wings, chestnut, with bay and metallic black wing bar; the feathers of the neck hackle are short and hard, green black, with delicate crimson brown shafts. The plumage of the hen is very difficult to obtain by breeding, and should be a combination of nut brown and green black throughout, green predominating. Along the breast bone of both male and female the feathers part and allow the skin to show just at or above the upper point of the keel bone. This is a distinctive feature of the breed and shows from the time the chicks shed the down. The breast is very wide, round, and prominent, and should always be oval and full in contour; the thighs are well rounded, nicely tapering, and thick and meaty next to the body; shanks, very stout, well scaled, and deep orange in color; back toe should be almost flat on the ground; tail, close and hard, carried well out, and sickles rather short; wings, tightly folded, the ends of the secondaries rounding off abruptly and resting close against the tail or just above it; eye, yellow, approaching gray; beak, yellow, or striped with horn color. The Indian Game is a beautiful bird, and its every movement bespeaks its high breeding.



Figure 36. Pair of White Indian Games.

The Malays are large and hardy, and are used for crossing with other breeds to infuse vigor and size. In disposition they are reputed to be very savage, and in battle often literally tear their opponents to pieces.



Figure 35. Red Pyle Game Cock.

Malay Games.

The Malays (Figure 38) are supposed to be one of the parent stock of the Black Javas. They have never been popular in this country and are bred for exhibition only, not possessing qualification for practical purposes. They are of medium size, and in carriage are particularly upright and powerful looking, the back standing always at an angle of 45 degrees. Their plumage is very close, and red or maroon or black. The body tapers from the broad shoulders to the tail, which droops almost in a straight line with the back. The thighs are long and powerful. The striking feature of the Malay is the head. It is long and snaky, the brows over the eyes heavy and projecting, giving the bird a cruel and fierce expression; the neck is long and scanty of hackle; the skin of the throat is a bright red and the scantiness of the plumage causes the red to show distinctly. This is a characteristic of the breed. The wattles and ear lobes are slight in development; the shanks and toes are bright yellow.

Black Sumatra Games.

Although a beautiful bird and possessing many fine points worthy the consideration of the fancier and breeder, the Black Sumatra Game is little known. It is gentle of disposition and attentive to its young. There is considerable comment against the Sumatras on account of their long flowing tail and apparent lack of pit qualities; but as to this those who have witnessed their defense of their mates and young differ. They may be slow in opening a conflict, but when occasion demands no bird can show a greater amount of staying powers than the Sumatra. In plumage they are a rich, lustrous black throughout. The tail is long and drooping, with an abundance of long, flowing sickle feathers and coverts. This is a point which severs all connection with the Pit Game and places them in the front rank of ornamental breeds.

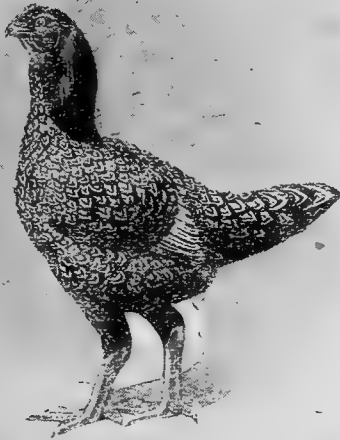


Figure 37. Cornish Indian Game Hen.

Game Bantams.

Game Bantams are diminutive representatives of the Exhibition Game. The color of plumage, markings, and shape most correspond with these features in the Game which bears its name, the diminutive size being the only distinguishing feature between the two. The cocks average 22 ounces in weight, the hens 20 ounces. The Malay Bantams average 2 ounces heavier.

Sebright Bantams.

Bantams are purely ornamental poultry and are kept for pleasure exclusively, though some contend they are profitable for eggs and table. This is hardly reasonable to suppose, as their diminutive size and small eggs would hardly pay for their keep other than for fancy purposes. The Golden and Silver Sebright Bantams were originated in the early part of the present century by crossing a common Bantam with a Polish fowl and breeding the cross to a hen feathered Bantam. After many years of successful breeding beautiful birds have been produced which breed true to type.

The plumage of the bird is a rich, golden yellow in the Golden variety, and silvery white in the Silver variety. The feathers of each variety are distinctly laced with a narrow edging of black. The head is small and surmounted with a bright red rose comb; the neck is well arched and hen feathered; the back is short and free from saddle feathers; the breast is round and full and the body compact; the wings are large and carried so low as almost to cover the hocks; the thighs are short, and the shanks and toes slate colored. The cock weighs from 24 to 26 ounces, the hen about 20 ounces.

Rose Comb Bantams.

Rose Comb Bantams are a miniature of Hamburgs. There are two varieties: the Black and the White. The cocks have a small, round head; a short and slightly curved beak; large, prominent, bright eyes; rose comb, square in front, fitting firmly on the head, evenly corrugated on the upper surface and ending in a spike with a slight upward curve; flat, closely fitting ear lobes; broad, thin, smooth and well rounded wattles; neck, small at the head, increasing in size as it approaches the shoulders, nicely arched, and carried well back; abundant hackle of good length, sweeping over the shoulders and tapering toward the tail; long and plentiful saddle feathers; full, round breast, carried prominently forward, plump, compact and symmetrical body; wings large, the points carried low, the secondaries slightly expanded; full, expanded tail, carried rather high and furnished



Figure 38. Malay Game Cock.

with long curving sickles and coverts; short, well rounded thighs, and short, clean, tapering shanks. The head of the hen should be small and neatly rounded; eyes bright and full; comb of the same character as the cock's, but smaller and neater; flat, smooth ear lobes; small wattles; short, tapering neck, carried well back; short back; full, prominent breast; compact body; ample wings, but not drooping so much as the cock's; full, expanded, upright tail; short, round thighs, and short, tapering shanks.

The plumage of the Black Rose Comb Bantam is lustrous black, and of the White, pure, spotless white. The beak of the Black is black or dark horn color; of the White, yellow. The ear lobes of the Black are pure white; of the White, red. The shanks of the Black are dark, leaden blue; of the White, yellow.

Booted White Bantams.

Booted White Bantams are distinguished, as their name implies, by heavily feathered, or booted, shanks. They have small heads and medium sized single combs. The hackles are long and partly cover the shoulders; the wings are large and slightly drooping; the tail is upright, with long sickles, and abundant coverts; thighs, medium in length, and covered with long, stiff feathers, or vulture hocks, which nearly reach the ground; toes and shanks, yellow. The plumage is pure white.

Cochin Bantams.

Cochin Bantams, Buff, Partridge, White, and Black, are in both color and shape the same as their large ancestors. They are the largest of the Bantam class. The cock weighs about 28 ounces, the hen 24 ounces.

Japanese Bantams.

The striking beauty and peculiarly shaped tails of the Black Tailed Japanese Bantams (Figure 40) make them great favorites and place them in the front rank of the Bantam class. They are white, except the tail and wings. The tail is black; the sickles black, edged with white. The wings are large and long, with drooping points; the color of the primaries and secondaries is dark slate, edged with white. When the wing is folded it shows only white. The tail is expanded and carried in an upright position, almost touching the back of the head; sickles are long and gracefully curved. The shanks are free from feathers and bright golden in color.

The White and Black Japanese Bantams are the same in size and shape as the Black Tailed Japanese. The beak, shanks and toes of the White are yellow, and those of the Black are yellow, or yellow shaded with black. The color of the White is pure white; of the Black, a lustrous black.

Polish Bantams.

Polish Bantams are of American origin, and appeared about 1872, produced by an accidental cross of a White Polish cock and a common hen. At first the chicks had small crests and the plumage was often disfigured by foul feathers, but under careful breeding the color has been established so that foul feathers no longer appear, and the crests have been nearly doubled in size. They were admitted to the Standard in 1879-80, and since then they have been disseminated throughout the country, although they are as yet comparatively rare in perfection.

Ornamental Poultry.

The Standard recognizes several varieties of poultry which are purely ornamental in character and purpose. They cannot, however, be considered as either prolific for eggs or superior for table purposes.



Figure 39. Pair of Red Pyle Games.



Figure 40. Black Tailed Japanese Bantam Cock.

Russians.

The Russian fowl is supposed to have been introduced into this country about fifty years ago, but the breed finds little if any favor here, and as a result it has become run down and scattered promiscuously. In size the birds are medium—the cocks weighing $8\frac{1}{2}$ pounds, the hens $6\frac{1}{2}$ pounds. The cock has a well formed head; rather large in size; stout, curved, black or horn colored beak; rose comb, without spikes; full, heavy beard, which curves around to the back of the eyes; medium sized ear lobes; long, pendulous wattles; well arched neck; broad back, tapering to the tail; full, round breast; compact, broad body; wings of medium size; strong thighs; legs of medium length, and dark lead in color; the bottom of the foot is yellow; tail erect and free from long sickle feathers. The hen is bearded like the cock; comb similar, but smaller; back of less width; full breast; tail of medium size, and carried moderately erect; legs same as cock.

Silky Fowls.

Silky fowls are not extensively bred in this country, but in England are very popular. Their soft, webless feathers, when in prime condition, are exceedingly loose and fluffy, standing out from the body in all directions, giving the fowl the appearance of a large bird, which their weight does not justify. The cock's weight is from $2\frac{1}{2}$ to 4 pounds, while the weight of the hen is from 2 to $2\frac{1}{2}$ pounds. The birds are of rather square, compact Cochin build; crested; the cock's crest running back horizontally, while the hen's is globular; five-toed; feather legged; rose comb, lumpy in appearance and dark purple in color; ear lobes blue or purple, tinged with white; skin violet, approaching black; plumage white and downy. Silkies lay a small egg of a pale buff color, and lay ten to twenty-five before wanting to sit. They make excellent mothers, and are very valuable to hatch and rear the tender little ones of the more delicate varieties.

Sultans.

Sultans (Figure 41) were exported from Turkey, into England, about 1854, and did not reach America till some years later. They might with propriety be classed with the Polish, considering the characteristics which they possess. A compact crest surmounts the head and they are full bearded. Two small spikes constitute the comb.

Figure 41.
Sultan
Cock.



The neck and saddle hackles are large, long and flowing. The legs are heavily feathered and booted, and hocks vultured. They possess a fifth toe. The tail is full and erect, and in the cock it is well sickled. While their beauty is their chief recommendation, they lay claim to modest usefulness, but only as layers, being too small for table fowls. They thrive well on a limited range or in confinement, and owing to their docility make excellent pets.

Frizzled Fowls.

Frizzled Fowls are the most grotesque members of the poultry family. Their name is applied from the peculiar manner in which their feathers curve upward and backward at the ends, as if in defiance of nature's laws. This curving is most conspicuous in the hackle and saddle feathers. As these birds vary in color, there is no rule for judging their plumage, except that it must have the peculiar upward curve; any color is admissible. The combs may be either double or single. Frizzled Fowls are reported to be hardy, and very early and good layers.

Yokohama Fowls.

Yokohama Fowls (Figure 42) are noted for the great length of the tail and hackle feathers. Another variety, said to be superior in these points, is called Phoenix Fowls. The Fung, or Phoenix Fowl, is one of the myths of the Japanese religion, and is often seen in Japanese pictures. It is thought the Yokohama Fowls are like those in the paintings, hence the name Phoenix is applied to the breed. The tails of these fowls average about a yard in length, and their colors and general appearance are those of the Games.



Figure 42.
Yokohama Fowls.
Long Tailed Japanese
Game,
or Phoenix Cock.

FEEDING POULTRY.

In feeding for egg production a valuable lesson may be learned from nature. It will be observed that our domestic fowls that receive the least care and attention, or, in other words, whose habits approach most nearly to the natural order of things, lay most of their eggs in the spring time. The weather then is warm and they have an abundance of green feed, more or less grain, with numerous insects supplying animal matter, and plenty of exercise and fresh air. They are enabled to scratch for the various roots and herbs (nature's poultry food) that their systems crave. Therefore, if we are to feed for egg production, let us not forget nature's lesson. Make it spring time all the year around by not only providing a warm place, but by giving them the proper proportion of grain feed, grain, meat, and some good condimental poultry food containing the necessary correctives that nature found it necessary to provide. The animal instinct is best. They know by a sort of sixth sense what they require, and, having the freedom and an unlimited run, are enabled to get it. When they are shut up and unable to obtain this, it is the owner's place to provide it. Farmers who keep only a small flock of hens, chiefly for the purpose of providing eggs for the family, frequently make the mistake of feeding too much corn. It has been clearly demonstrated that corn should not form a very large proportion of the grain ration for laying hens. It is too fattening, especially for hens kept in close confinement. Until the past few years corn has been considered a universal feed for poultry. This no doubt has been largely brought about by its cheapness, but the American poultryman has awakened to the fact that it is useful mainly as a fattener, and he is using the smaller grains with the proper mixture of a good poultry food and meat scraps, and is feeding his hens on a scientific basis. The small farmer will do well to follow in his tracks.

When comfortable quarters are provided for the fowls, the nutritive ratio for a fowl should be approximately one part of protein to three and one-half to four parts of carbohydrates. Wheat is preferable to corn; oats make an excellent feed, and perhaps come nearer the ideal than any other single grain, particularly so if the hull be removed. Buckwheat, like wheat, is of too wide a nutritive ratio to be fed alone, and produces a white flesh and a very light colored yolk if fed in large quantities. In feeding poultry for egg production, as in feeding a cow for a large yield of milk, the ration should be made up of various grains, combined with meat scraps and a good condimental poultry food, this latter serving to supply palatability and to increase the digestibility of the grain. This invariably gives much better results than is obtained by feeding with one grain alone. It has been demonstrated by actual experiments that the fowls not only relish their ration more, but that a much larger percentage of the whole ration is digested. And it is a well known fact that feed relished by the fowls gives a finer flavor to the eggs. This is in itself a sufficient reason for supplying wholesome feed and palatable rations to the fowls.

It is conceded by the majority of poultrymen that ground or soft feed should form a part of the daily ration. From an economical standpoint it is desirable, for the reason that it will be digested and assimilated quicker than the whole grain. This is especially true if Davis Poultry Food is added to the ration. A mixture of equal parts of ground corn and oats, added to an equal weight of wheat and bran middlings, with one-fourth of the ration made up of meat meal, and a due allowance of Davis Poultry Food, makes an ideal morning feed if mixed with milk or water, thoroughly wet but not sloppy. If the mixture is inclined to be sticky, the proportion of bran should be increased. A little linseed meal will prove profitable, particularly during the molting period. If meat scraps or animal meal are to be fed, either Davis Meat Meal or Davis Meat Scraps should be used. About one pound of meat meal should be fed to twenty-five hens.

The grain ration for chicks should consist largely in a mixture of seeds, such as Davis Chick Feed, with which Davis Poultry Food is mixed in the correct proportion, making an ideal poultry food of the correct ratio. The farmer himself, however, can make a mixture of wheat, oats, and perhaps a little ground corn. This should be scattered in the litter covering the floor. It is necessary that the floor

of the poultry house be covered with a litter of some kind to insure cleanliness. Straw, chaff, buckwheat hulls, cut corn stalks—all of this makes an excellent litter. The object of scattering the grain in this litter is to give the fowls exercise. All fowls that are noted for egg production are active, nervous, and like to be continually at work. Feeding the grain as described will go a long way toward providing them with exercise and a method of working off their surplus nervous energy.

If the fowls are fed three times a day, they should be fed very lightly at noon. At night, just when they are going to the roost, they should have all they will eat. At no time should mature fowls be fed more than they can eat. Keep them always active, their appetite always keen; this will insure perfect health and a good egg production. Davis Poultry Food, if used according to directions, will insure these results. It is an ideal appetizer, keeps the system in perfect health, and for the production of eggs there is nothing better known. It thoroughly tones up that mysterious mechanism of the fowl that produces eggs. It supplies a great amount of the material necessary in this process and insures the digestibility of all the nutriment in the feed that are necessary for the production of eggs. Exhaustive experiments have demonstrated that the egg production can be increased 15 to 20 per cent by the continual and regular use of it.

Green Feed.

While perhaps not strictly necessary for their existence, green feeds of some kind are necessary if the greatest production of eggs is to be obtained. When fowls are kept in pens and yards throughout the year it is always best to supply a certain quantity of it. The question of how to supply the best feed most cheaply is one that each individual must solve largely for himself. In a general way, however, it may be stated that during the winter and early spring months mangel wurzels, if properly kept, may be fed to good advantage. The fowls relish them and they are easily prepared. It is not difficult to grow from nineteen to twenty tons of these per acre, and their cost is not excessive. In feeding these beets to flocks of hens, a very good practice is simply to split the root lengthwise with a knife. The fowls will then be able to pick out all the crisp, fresh feed from the cut in the surface. These large pieces also have an advantage over smaller pieces in this respect: that the smaller pieces when fed from trough or dishes will be thrown into the litter and soiled more or less before being consumed. Large pieces cannot be thrown about, and remain clean and fresh until wholly consumed.

Clover, during the early spring, is without a doubt one of the best and cheapest of green feeds. It is readily eaten when cut fine in a fodder cutter, and contains a considerable amount of protein. If clover is frequently mowed, fresh feed of this kind may be obtained nearly all summer, particularly so if the season be a wet one. Should the supply of clover be limited, or the season unusually dry, green feed can be grown in the form of Dwarf Essex Rape. This should be sown in drills and given the same cultivation as corn and potatoes. When the rape is from 8 inches to 1 foot in height it may be cut and fed. It furnishes a fresh, crisp feed that is readily eaten. If cut a few inches from the ground, a second and third crop may be produced from one seeding. Alfalfa is also excellent, and will furnish an abundance of green feed. It must, however, be cut very frequently, each cutting being made before the stalks become hard and woody. A good quality of clover hay, cut fine and steamed, also will make an excellent addition to the feeding ration of laying hens.

Cabbage can be grown cheaply in many localities, and makes an excellent green feed as long as fresh. Sweet apples, and, in fact, almost any crisp, fresh green feed, can be fed with profit. The green feed, in many instances, may be cut fine and fed with the soft feed, but as a rule it is better to feed it separately during the middle of the day, and only in such quantities that it can be eaten up at once. Most of the foregoing, of course, relates to fowls confined in pens. Where the chicks have a large run they will gather for themselves during the season all the green feed they require.

Grit.

It is absolutely necessary that fowls have access to some kind of grit, if grain feed is fed in any considerable quantity. For this purpose there is nothing that can be compared with Davis Mica Spar Cubical Grit. This is made from pulverized granite rocks, containing quartz, the hardest of rock substances, sodium aluminum, magnesia, lime, and iron. In the gizzard it flakes off, does not become dull and is a perfect grit. In addition to this it supplies material for the shell. For young chicks Davis Broiler Teeth is to be recommended.

It is composed of the smallest size of crystal grit, bone and oyster shell, in about equal proportions, and should be in every poultry house. Chemical analyses and experiments, together with reports from many practical poultrymen, show conclusively that the ordinary grain and the green feed supplied to laying hens does not contain enough lime for the formation of egg shells. It requires several times as much lime as is ordinarily fed if good strong shells are to be produced. Davis Broiler Teeth supplies this excess of lime, so necessary for the egg production, and if it is kept continuously before the fowls you can trust to them and their instinct to eat the amount necessary to supply lime, rather than in mixing it with the feed.

Meat Feed.

When fowls are kept in confinement, it will be found absolutely necessary to supply them with a certain amount of meat and cut bones. Davis Meat Scraps are especially beneficial. Davis Meat Meal is a mixture of cut beef, bone and blood. Davis Coarse Ground Bone or Raw Bone Meal should also be supplied. All these preparations are specially prepared from fresh meat or bone and, in selecting a meat feed for his poultry, the owner should assure himself that no tainted meat or tainted bones are used. Skim milk, if there is a sufficient quantity of it, may be substituted in part for the meat feed, without any decrease in the egg production, provided the proper grain ration is given.

CONDIMENTS AND ANIMAL MATTER A NECESSITY FOR POULTRY.

It is well known that poultry, when allowed to range at will, will eat a considerable quantity of animal matter in the form of insects, worms, etc. They will also partake of the various seeds, roots and herbs (nature's poultry food) that are so necessary to keep their system in proper condition. How very necessary animal matter especially is to fowls was strikingly brought out by recent experiments at the New York Experiment Station. Two lots of chickens and ducks, as nearly alike as possible, were used in those experiments. One of the lots, in each case, was fed a ration of mixed grain and skim milk or curd, containing no animal matter; the other was fed a ration of mixed grains with animal meal, fresh bones, or dried blood. The two rations were about equally combined, although the animal matter contained a little less protein than the vegetable matter ration. The distinctive difference between the two rations was that in the one case two-fifths to one-half of the protein came from animal sources, while in the other it came from vegetable sources. In each case more feed was eaten by the lot receiving animal protein, the gain in weight was more rapid and maturity was reached much earlier, less feed being required for each pound of gain, and the cost of gain was less. This emphasizes the advisability, in fact, the absolute necessity, of feeding such preparations as Davis Meat Scraps and Davis Meat Meal; and if either of these preparations is used in connection with Davis Poultry Food surprisingly large gains and a great increase in the number of eggs will be seen almost immediately. Young chickens fed on Davis Meat Meal, to each 3 pounds of which 1 tablespoonful of Davis Poultry Food has been added, can be raised at a cost not to exceed 6 cents a pound, and they will bring better prices on the market, owing to their healthier and better developed body. They will also mature at least two months sooner, and pullets so raised will start laying from four to six weeks sooner.

The results obtained in the feeding of ducks according to the above method are even more startling in their contrast than with the chickens. It will be noticed that the animals raised with a liberal allowance of Davis Beef Scraps, or Meat Meal, and Davis Poultry Food will be developed rapidly and evenly, and will gain as much in four weeks as those fed on a straight corn ration will gain in eight weeks; and exhaustive experiments have proved that rations in which 40 to 50 per cent of protein is supplied by animal matter give much more economical results and quicker gains, especially if Davis Poultry Food is added. It not only makes flesh much more rapidly but at a lower cost.

General Poultry Feed.

The chief feeds for poultry on the farm are represented by the various grains, especially corn and oats, corn possibly forming the basis to the greatest degree. Several years ago extensive digestion experiments with poultry were conducted by the United States government. In the following pages we give the results and draw conclusions for the benefit of the reader.

Feeding Small Chickens.

From the first twelve to thirty-six hours after hatching, the little chick requires little if any feed. For the next few days there is nothing better than stale bread soaked in milk. This should be crumbled very fine, and placed where the little chicks will have free access to it, but it should be protected so that they cannot walk in it, thus contaminating it with the filth and dirt of the yard. One of the most difficult problems for amateur poultrymen is that of devising systems for feeding little chicks so that they will consume all of the feed without soiling it. If placed on the floor of the brooder or the brooder run, the larger part of the feed will be trampled upon and soon become unfit to eat.

A simple and efficient feed trough may be made by tacking a piece of tin about $3\frac{1}{2}$ inches wide along the edge of a $\frac{1}{2}$ -inch board, so that the tin projects about $1\frac{1}{2}$ inches on either side of the board, bending the tin so as to form a shallow trough, and fastening the board to blocks so as to raise it 1 to 2 inches from the floor.

Within a week the chicks should be fed upon Davis Chick Feed. It is just the article which they need to get them started right. It is composed of the best grains, seeds, etc., thoroughly cleaned and free from dust, and is properly balanced, so as to produce quick growth and keep the system in a healthy condition. To obtain best results 1 teaspoonful of Davis Poultry Food should be added to the feed for fifty small chicks. Davis Chick Feed will carry the chicks along in perfect shape. They will make phenomenal gains, and after they are six to eight weeks old the ration should be changed, and they should be fed on Davis Alfalfa Meal and Davis Mixed Poultry Feed. If it is desirable that they be pushed rapidly, Davis Poultry Food in the proportion of 1 tablespoonful to every twenty chicks should be added to the feed. If the poultryman does not care to purchase these feeds he can find good substitutes for them right at home. Granulated oats, with the hulls removed, make an excellent feed for young chickens. There is perhaps nothing better. The chickens should have free access to some kind of grit after the first day. It was for exactly this purpose that Davis Broiler Teeth was first conceived and is now put on the market. There is nothing better or more economical. If the poultryman, however, does not care to buy the grit, good, coarse sand, screened, will make an excellent grit for young chickens.

There is nothing better as a supplementary feed for young fowls than skim milk, but it requires some skill in feeding. One of the great difficulties in chicken raising is to carry young chickens through the first two weeks without bowel disorder. If Davis Prepared Poultry Feeds are used in connection with Davis Poultry Food there will be little difficulty experienced along this line. Care must be taken, however, that the temperature of the brooder does not run too low. Improper and injudicious feeding, even if the right kinds of feed are given, plays an important part in producing those disorders. After the first ten days milk may be given more freely, perhaps, than during the earlier stages of the chick's existence. As the chick becomes a little older, more uncooked feed may be used. A mixture of fine middlings, wheat bran, a little corn meal, and a little linseed meal and Davis Poultry Food, all mixed with milk, makes a valuable feed. Hard boiled eggs are also very nutritious for the young chicks, but care should be used in feeding them.

Drinking fountains require close attention. Small chickens drink frequently, and oftentimes with their beaks loaded with feed, which is left to a greater or less extent in the water supply. As it is necessary to keep these fountains in a tolerably warm atmosphere, they soon become tainted and emit a disagreeable odor. This condition should not be allowed to exist for a minute, and the greatest care should be observed in order that all the feed and drink consumed by the fowls be sweet and wholesome. It has often been said, and the saying is a familiar one, that "cleanliness is next to godliness," and it is certain that "cleanliness is next to success" in poultry keeping. Above all, keep your fountains clean. Automatic fountains, such as can be purchased for nominal sums, should be used, and they should be scalded out at least once a week. If you do not care to purchase one, a cheap and efficient fountain may be made of a tin can with a small hole in one end near the side of the can, under which is soldered

a crescent shaped piece of tin, forming a lip or small receptacle for water. If the can is filled with water and then placed on its side a small quantity of water will run out of the opening and remain in the crescent shaped lip. As the chicks drink the water a quantity of air will pass into the opening and a little more water will flow out, thus keeping for the chickens a small quantity of good, clean water at all times.

Brooders.

If one resorts to artificial incubation it will be necessary to provide a brooder of some kind. It may be simple and quite inexpensive, or complex and costly. It is not necessary to expend very much money in the construction of an efficient brooder. It is necessary, however, to see that the brooder is capable of doing certain things. Some of these requisites are summed up in the following: It must be warm. The little chickens require a temperature of from 90 to 100 degrees the first few days, and at all times they should find it so warm in the brooder that they are not inclined to huddle together to keep warm. If the brooder is automatic, then the temperature may be kept even throughout the whole floor space. If, on the other hand, the brooder is heated from one side or from the top and is not automatic, it will be best to construct it so that certain parts of the machine will be very warm, in fact, a little warmer than is necessary for the chickens, and some other parts somewhat cool. It does not take them long to learn just where the most comfortable position is. They may be trusted entirely to select the proper temperature if the brooder is of sufficient size so that it never is crowded. A brooder constructed on this plan will require less attention than almost any other. It may undergo a considerable variation in temperature without overheating or chilling the chickens.

The brooder should be easily cleansed and so constructed that all the floor space can be readily seen. Inconvenient corners are objectionable in brooders—in fact, any corner is objectionable—but if brooders are constructed cheaply it is almost necessary to make more or less corners. If constructed of wood, circular ones are somewhat more expensive than square or rectangular ones. The floor must not only be kept clean, but dry.

Top or side heat is to be preferred to bottom heat, but there must be sufficient bottom heat to keep the floor dry.

As the chickens get a few days old plenty of exercise must be provided. One objection to many of the brooders in the market is that the chickens are kept too closely confined and not allowed sufficient exercise. It will be a matter of surprise to many to learn how much exercise these little fellows require. With the young chickens, as with the athlete, strength is acquired with exercise, and, above all other conditions of growth, strength is the one thing necessary in the young chicken.

Incubators.

The modern improvement in incubators has made the rearing of fowls solely for egg production quite out of the question unless these machines are used. No experienced poultryman at the present time will attempt to rear fowls in large numbers for the production of eggs and depend on the hens that lay the eggs for incubation. The Mediterranean fowls cannot be depended on for natural incubation, and artificial incubation must be resorted to if these fowls are to be reared in considerable numbers.

There are many kinds of excellent incubators on the market, and, as with many kinds of farm machinery, naturally some are better than others. Then, too, an incubator that would give very satisfactory results with one individual might prove to be quite inferior in the hands of another person. What is best for one is not necessarily best for another. It is advisable before investing extensively in any make of incubator to understand the machine thoroughly. If good results are obtained, then additional machines of the same kind should be purchased. Failures are recorded simply because the individual fails to understand thoroughly the machine he is trying to operate, or, in other words, fails to learn how to operate that particular machine to the best advantage. A successful poultryman must necessarily pay close attention to petty detail. Not only is this necessary in caring for little chickens and mature fowls, but also in the care and management of incubators and brooders. The whole business is one of details. While incubators may vary considerably in one form or another, yet there are certain points to which all should conform. Some of these points are summed up as follows:

1. They should be well made of well seasoned lumber. The efforts of the manufacturers to meet a popular demand for cheap machines has placed upon the market incubators that are not only cheaply made, but made of cheap and not thoroughly seasoned material.

2. The incubator should be easy of operation. All its adjustments should be easily made and so arranged that the more delicate machinery is in plain view of the operator. The machine should be automatic in operation. When supplied with the necessary heat, it should control perfectly within certain limits the temperature of the egg chamber. This result is accomplished in various ways. The regulating force, whatever it may be, should be placed within the egg chamber so that the regulator may vary as the temperature in the egg chamber varies, irrespective of the changes of temperature of the room in which the incubator is placed. The regulator must be sensitive. The change of temperature which is necessary for the complete working of the regulator ought not to vary more than 1 degree above or below the desired temperature. It is better if the range of temperature can be reduced to one-half of 1 degree, thus making a total variation of 1 degree instead of 2 degrees.

It should not be inferred that a much wider variation than this will not give excellent results under otherwise favorable conditions, but, other things being equal, those machines which are most nearly automatic should be preferred. The Reliable Incubators come as near meeting all these requirements as any now on the market and should be given the preference.

In addition to the foregoing requisites, a convenient appliance for turning the eggs, positive in its action, should accompany each incubator. This may be an extra tray that is to be placed bottom side up over the tray of eggs and held firmly in this position while both trays are turned, thus completely transferring the eggs from one tray to another without jar. The different machines have very different appliances for obtaining this result. Excellent results are obtained by the use of many machines now on the market when the operator of these various machines is thoroughly interested. Poultrymen for a number of years have hatched in incubators over 80 per cent of all eggs put in the machine. It must not be inferred that this is an easy thing to do. A record of this kind is attained only by close observation and good judgment, not only in running the machine, but also in the breeding and care of the fowls to produce fertile eggs.

GROWING BROILERS.

Poultry specialties are all the time becoming more and more specialized. Most of the large growers have some special subbranch to which they devote more attention and from which they get the greater part of their profit. Well known growers now make a specialty of the growing of small broilers, which are sold at a weight approximating $\frac{3}{4}$ pound when dressed. Chickens of this size are from five to eight weeks old, smaller than pigeons, and to the ordinary farmer would look too diminutive for use, but high class hotels and swell clubs in Chicago, Boston, New York and elsewhere are glad to pay as much as 75 cents for them in winter and spring. One grower in Massachusetts, who has built up an exceptionally large trade of this description, sells nearly 300 of these small broilers from January 1 to January 20, principally to Boston hotels and clubs and high class private trade. This branch of the trade is continued the year around. Incubators are started in January and up to 10,000 chickens are hatched out during the year. The breeds used for broilers are Wyandottes and Plymouth Rocks. Even for light weight broilers, such as are produced there, small breeds, like the Leghorns, are not satisfactory. They need to be a couple of weeks older than the Plymouths to give the same weight.

The chickens should not be fed for the first day after hatching. Their first feed may consist of broken crackers, softened in water. Cooked mush and bird seeds are also good. If, however, it is desired to have the chicks started to the best possible advantage, insuring their rapid growth and perfect development, Davis Baby Chick Feed will prove the ideal ration for newly hatched broods. It is composed of the best grain, seeds, etc., thoroughly recleaned and free from dust, and has proved by experience a perfect feed for young chicks. By its use they develop quickly, have a strong frame work, are healthy, and withstand the diseases to which they would otherwise be in danger of succumbing. Davis Baby Chick Feed contains all the essential elements of a well balanced ration for chicks until they are five or six weeks old, and they will not need any other feed during that time. No farmer or

poultry raiser can afford to be without it. As soon as they get well started, corn meal and middlings may be added to the ration of the chicks, making it an even half and half, which is made early in the morning and allowed to stand until about 9 o'clock and fed warm. The little chicks should be fed very often at the outset, four or five times a day or oftener. After the first five or six weeks a good plan to follow is to feed the chicks hard grain in the morning and cracked corn, cracked wheat or cracked oats at noon and night. If the best results are desired, Davis Poultry Food should be added to the ration in the proportion of 1 tablespoonful to each thirty chicks. Davis Meat Scraps in the proportion of about 1 quart to each 2,000 chicks, mixed with the mash, may also be fed with excellent results. For green feed give them cabbages to peck at and steamed clover hay, if convenient. Davis Mico Spar Cubical Grit and charcoal and water should be kept constantly before them.

Warm, snug and comfortable quarters should always be provided for the young chickens. The Massachusetts grower, referred to, keeps them warm by hot water pipes about 6 inches from the floor of the pen. Sand is filled in under the pipes to varying heights, according to the size of the chickens. The ends of the pipes nearest the boiler are warmest and the youngest chickens are kept there. A great point in raising healthy winter chicks is to keep them scratching. The grain or Davis Baby Chick Feed is always fed in sand or litter in order to make the chickens work for it. All the chickens are raised by incubators and brooders, and by comparison with hens which are used some years it is found that 25 per cent more chicks can be raised by the use of incubators and brooders.

In finishing off chickens for the market the orders which are pending become a feature. If a lot of chickens are needed in a hurry, the required number are put in a fattening pen and fed all they will stand. As great a variety of feed as possible is given them, and just before they have had all they want the dishes are removed, leaving them slightly hungry. Then the next feeding time they will be looking for more. Davis Poultry Food, added to the ration in the proportion of 1 tablespoonful to each thirty chicks, will be of the greatest possible assistance in forcing the process of feeding at this time. It will insure the rapid fattening of the chickens and it has been demonstrated that it adds from 20 to 30 per cent to the nutritive and digestive qualities of the feed, thus not alone hastening the period of fattening, but actually saving the grower from 20 to 30 per cent in feed value; and, as its cost is comparatively insignificant, it cannot be too highly recommended for this purpose. When Davis Poultry Food is added to the grain ration the chickens also are able to stand a high pressure feeding process much better, the reason being that it contains ingredients which stimulate the digestive organs to greater activity and insure the perfect assimilation of the feed. Chickens which are to be kept for a longer period must be fed less, and kept hungry all the time, so that they are ready to fly about the pen when the man comes around with the feed. They must be kept scratching. At the time when the chickens are ready for the market a good method is to carry them in baskets to the place where they are to be killed, and dispatch them by stabbing the back of their mouths with a lancet. Do not remove the head. They should not be fed for twenty-four hours before killing and the entrails should not be removed. They should be dry pickled and packed in pasteboard or other convenient boxes, two and two together. An ice box for cooling the dressed poultry during the warm weather is quite indispensable. Other practical, up to date methods for the killing and dressing of poultry for the market, according to the customs prevailing in each particular locality and the wishes of the dealers, may of course be adopted with as good results as the foregoing.

Intensive farming in or near a city, where the market is located, may be carried on to the greatest advantage by the raising of broilers. The most delicate part of the business is to raise them. Where there is no room to spread out growing stock, it is almost necessary that one should live with them, so to speak, in order to be able to properly care for them. Above all, they should be kept clean and healthy. It has been demonstrated by experiments that it is not one particular kind of feed that is required to raise the little artificially hatched orphans: cleanliness, ventilation and a correct temperature maintained at all times play a greater part than any prescribed method of feeding. The first four or five hours after they are taken from the incubator they should be put in a clean brooder that has been heated to 90 degrees with top heat. Cover the floor $\frac{1}{2}$ inch deep with good dustless alfalfa meal and sprinkle a little Davis Baby Chick Feed and Davis Mico Spar Cubical Grit over the sand. If this is not at hand, ordinary chicken grit may be used and the chicks may be fed a very small quantity of rolled oats as the first day's

ration. Feed sparingly the first day and throughout the first week. Davis Baby Chick Feed is the ideal ration for them during this period, insuring good health, rapid growth and immunity from disease. It should be fed to them in small quantities every two hours, after they have been in the brooder for twenty-four hours, and if used no other feed will be required during the first five or six weeks. In its absence rolled oats, fine cracked corn and millet seed, fed in small quantities every two hours or so, may be used. From the first hour of their life in the brooder they should be allowed all the fresh, cold water they want. A combination of Davis Raw Bone Meal, dry wheat bran, Davis Mico Spar Cubical Grit and charcoal, put before them in self feeding boxes, so that they can peck at it whenever they feel like it, forms an excellent adjunct to the feeding. At three weeks of age a feed of warm mash each day may be added, and when the chicks are nine weeks old hard grain, to which has been added 1 tablespoonful of Davis Poultry Food to each thirty chicks, may be fed with advantage. It is well to vary their ration considerably after this time, and all kinds of green feed may be put before them. To see how the little things throw themselves over the green stuff given them is a pleasure as well as a profit to the owner and caretaker. The same holds good of fresh meat and bones, served in proper proportions, and Davis Coarse Ground Bone and Meat Scraps will do wonders at this stage in the way of strengthening and developing them. Ordinary leavings of meat, chopped fine, and bones from the table may serve if they are not at hand.

An essential for the raising of good, healthy, well grown broilers is to produce them from eggs in which the germs are strong and perfectly developed. It is hardly possible to get such eggs from birds that are kept closely confined, and it will therefore be found of great advantage to give the layers lots of range.

To Make Broilers Ready for the Market.—It is a good plan as soon as the chickens are nearly large enough for broilers to put them into a pen containing a shady run. Give them all the fattening feed they will eat, but remember that muscle and bone making feed is not required at this period. Corn in various forms is excellent, and should be fed freely to them. Cooked corn, mashed corn and ground corn, as well as whole corn, should be fed daily. Warm potatoes and bread crumbs are also good for making fat. Any kind of milk and a little sugar now and then are also to be recommended. At this time the grower will be amazed to note the effect Davis Poultry Food, added to the ration in the proportion of 1 tablespoonful to each twenty chicks, will have on the fowls. It will decrease the fattening period by at least 10 per cent, adding from 20 to 30 per cent to the nutritive value of the ration. This is done by its influence upon the organs of digestion, stimulating them into healthy activity and enabling the chicken to partake of a much larger quantity of feed than would otherwise be the case. When Davis Poultry Food is used, every kernel of grain or bit of feed eaten by the fowl is perfectly assimilated, thus insuring the grower against all loss or waste by undigested feed that otherwise would have occurred. It is just the thing for quickening to the greatest possible degree the fattening process; and all poultrymen know that it is of supreme importance at this stage to have the fowls lay on fat every hour, and that if they do not the whole venture is likely to culminate in a losing operation.

In order to secure hens that will produce eggs for hatching in December, January and February, the pullets should be hatched early, and they should be kept growing and made to lay so early that, when the time arrives that eggs are needed for the incubator, you will have them on hand. Keep up the growth of the pullets throughout the summer, feeding them with wheat and mixed grains, adding 1 tablespoonful of Davis Poultry Food to each meal for each twenty fowls. Keep the chickens scrupulously free from vermin and place them in winter quarters about October 15th.

One Method of Dressing and Preparing Broilers for the Market is to scald and pick them and convey them in wooden barrels. Remove the feathers, but leave the head and feet on. If the weather is warm, crushed ice should be used in the shipping. First put in a layer of broilers, then one of ice, and continue in this manner till the barrel is packed. Over it all put a large piece of ice weighing from 20 to 50 pounds. A cover of burlap may be put over it all and fastened to the barrel. The barrel should be lined with coarse brown paper (ordinary packing paper, as you get it from your grocer) if the shipping takes place in the cold season of the year, and it is also a good plan to put in a layer of this paper between the different layers of broilers and ice. The head should not be scalded with the other parts of the body, for if you do it will look pale and white, making it appear as if the chicken had been sick when it was killed. If not scalded the color will be red and fresh, and this means a difference of several cents a pound. The chickens after they are picked should be scalded in the ordinary manner in water a little below the boiling

point; then immediately put them into a vessel of fresh, clean, cold water. They should be left in the cold water until thoroughly cooled, which in the warm season will take several hours. A little salt thrown over them while in the water is recommended, and will give them a delicate white color, drawing the blood out of the skin.

FEEDING FOR EGGS.

In the feeding for-eggs it should always be borne in mind that a more mixed and varied diet is required by hens than any of our domestic animals. If the best results are to be obtained it should also be remembered that too close care and attention cannot be given them on the part of the feeder; and it is a well known fact that it is almost impossible for the layman to determine conclusively which of two or more grains constitutes the best feed for hens, as egg producers.

Rye and wheat undoubtedly are good feed for fowls, but should only be part of their daily ration. Buckwheat is beneficial, but contains a little too much starch, and should therefore not be fed excessively. And even corn, which experiments have demonstrated to be an excellent feed for fattening only—although many farmers take an opposite view—ought not to make up the entire ration. Rather give a mixture of the different grains, and experiment to find out what proportion will give the largest number of eggs, then stick to it. The farmer will find that if Davis Poultry Food, in the proportion of 1 tablespoonful to each twenty hens, is added to the daily ration it will add materially to a hen's value as a layer, and it should always be at hand. It will make a great saving in the feed bill and if given a fair trial will readily demonstrate its worth to the intelligent grower of poultry. Again, if hens are fed their grain feed in such a way that they are obliged to exercise vigorously, their laying powers will be proportionately increased. Feeding them nicely prepared feed from troughs and dishes should therefore be avoided. Rather give them a mixture of grain feeds scattered in a litter of cut straw or on a graveled floor, so that they will have to scratch and search for it. Remember that if large eggs with a strong shell are to be secured plenty of cut bone and grit must at all times be accessible to the hens. Davis Coarse Ground Bone and Davis Mico Spar Cubical Grit are ideal preparations for this purpose, and will pay for themselves over and over again. If early eggs are desired the usual ration must be increased, especially if Davis Poultry Food is not used. Most farmers have plenty of clover hay at hand, and if the hens are fed a few pounds of this finely chopped each week, it will result in a greatly increased egg production. Davis Alfalfa Meal is the best, but for lack of this clover may be used. Follow this method: The hay should be cut into as short lengths as possible ($\frac{1}{4}$ to $\frac{1}{2}$ inch or so). At night fill up a pail or bucket, capable of holding several gallons, cover the hay with water, place the bucket on the stove, and let it boil throughout the entire evening until the fire goes out. In the morning during the breakfast hour the hay should be permitted to heat up again, and subsequently the water should be drained off and the hay mixed with about 3 quarts of wheat bran, enough to make it crumbly. Finally, 3 pounds of Davis Meat Meal or Davis Beef Scraps should be added and the whole thoroughly mixed. This will make two gallons of excellent feed. This ration, however, is for cold weather only and suitable principally for hens that have a free run. Late at night you may supply as much corn as the fowls will consume during one day. Thereafter change to oats and wheat, and so on, varying the ration constantly. Fresh, clean water should always be near the hens, and in order not to have it freeze, it is advisable to warm the water slightly on cold winter mornings. The poultry house should be warm and snug, of a good, tight construction, and should always be fronted to the south. It is a fact that the warmer the hens are enabled to keep during the winter months, without it being necessary to resort to artificial heating, the quicker they will become broody and the larger will be the number of eggs. Do not make the mistake of feeding the fowls corn and wheat or either of the two exclusively. Many farmers are in the habit of substituting other feeds with wheat in order to avoid making the hens overfat. This is wrong. They forget that wheat, too, contains a large percentage of starchy matter,

while corn, as an exclusive ration, is much too rich in carbonaceous ingredients. Both grains will fatten poultry with almost equal rapidity. Wheat contains more gluten than corn and is therefore perhaps preferable on that account, but to make it an exclusive ration or feed too much of it will have the same effect upon the hens as corn; in other words, it will make them overfat.

As excellent feeds, to make up the mixed ration so necessary for a good production of eggs, may be mentioned wheat and corn, or oats and buckwheat, or either, and, in combination with the grains, scalded corn fodder or ensilage, cooked turnips, small potatoes and anything in this line may be fed with advantage, especially when warm. Numerous elements enter into the production of the egg, and this will make it apparent that a wide variety in the feeds is necessary if a first class product is to be obtained. Davis Poultry Food is always a valuable adjunct to the ration, and no up to date poultryman can afford to be without it. It insures perfect assimilation and thorough digestion in the chickens.

Davis Meat Scraps may be fed twice or thrice a week with good results.

As the nights grow colder, feed the chickens nice, sound corn three times a week, added to the usual variety of wheat, oats, barley, etc. This will aid in preserving the animal heat during the long, cold nights. The value of the corn may be further increased by feeding it well warmed on the stove. Linseed meal, too, is valuable, but should be fed in small rations. Beans and peas are good for laying hens when fed twice or thrice a week. If linseed meal is fed too freely it is apt to cause looseness of the bowels, and molting is also often produced. Plenty of sweet milk is advantageous, and a little buttermilk now and then. Bowel trouble is likely to ensue if buttermilk is fed too freely. All kinds of meat, fresh or dried, are recommended. If a supply of Davis Meat Scraps and other poultry feeds be bought in the fall it may be depended upon to greatly decrease the feed bill. Loose heads of cabbage, potatoes too small for other use, deformed and knotty apples, and all such vegetables as are usually allowed to go to waste on the farm may be gathered and stored away, and will aid materially in furnishing the needed variety at a reduced cost. Keep your hens active, scratching and working for their feed by scattering this among the litter on the floor, made up of straw or leaves. Do not overload them with feed or keep it constantly before them, as a good many poultrymen erroneously do; this will cause them to grow lazy and their appetite will vanish. A quantity of tincture of iron occasionally, mixed with their drinking water, should be given, though not necessary if Davis Poultry Food is used regularly. Corn on the cob is good. Feed them also millet heads when the seed has ripened, and oats in the sheaf.

A plentiful supply of pure, fresh air is indispensable to the laying hen. Eggs laid in badly ventilated, ill smelling quarters are unfit for human consumption, and if used for hatching the chicks will not be up to the standard in health or quality. Hens which as early as February are laying eggs intended for hatching must be provided with a good varied ration that will keep them in nice trim, and also must have plenty of exercise. They should be kept neither too poor nor too fat. In order to exercise them, a good way is to fill the pen six to nine inches deep with chaff, corn cobs and butts, refuse hay, etc., and scatter the grain in it, keeping the hens hungry enough to diligently hunt for it. At night give the chickens all they want of cracked corn, oats, wheat and barley. Breakfast should be rather frugal, consisting preferably of corn meal, crushed oats and bran, to which mash has been added a quantity of Davis Meat Scraps or Davis Poultry Meal. This will add materially to the egg laying ability of the hens. Scatter the feed in the litter so that they have to scratch for it throughout the day. When the weather allows it keep a window open in the pen all day. Grit, charcoal and fresh, cold water should be constantly before them. No better shell producer than Davis Oyster Shell Grit is in existence. The prudent poultryman will always make sure to have a good supply of this at hand.

As has been indicated in the foregoing pages, a variety of feeds is of great importance if the hens are to be brought up to the highest standard as egg producers. It must also be remembered that a certain quantity of bulky feed, as well as a plentiful supply of green feed, is indispensable to the successful raiser. Therefore see that you at all times have at hand for the chickens cabbages, vegetables, apples, cut clover that has been soaked in boiling water, etc., and feed it in the morning with the regular meal in the mash, or give it to them in the evening—but feed it sparingly, so that the fowls will not lose their hunger and quit scratching for the other feed. This will insure strong, fertile germs in the eggs intended for hatching, and the eggs for human consumption will have a fine, delicate flavor. Be careful not to let the eggs for hatching get chilled.

One poultry keeper out west, who has been exceptionally successful in producing winter eggs, feeds as follows, varying the ration from day to day: First meal Sunday, vegetables; second meal at noon, whole wheat in the litter; evening meal, wheat in the litter and whole and cracked corn. Monday morning, sheaf oats; evening, warm mash. Tuesday morning, vegetables; midday, cut green bone; evening, cracked corn, scattered in the litter. Wednesday morning, sheaf wheat; night, warm mash. Thursday morning, vegetables; midday, whole wheat in litter; evening, whole corn in litter. Friday morning, vegetables; midday, green cut bone; evening, cracked corn in litter. Saturday morning, sheaf wheat; night, warm mash. Davis Poultry Food, to the extent of 1 tablespoonful to each twenty fowls, should be fed in each meal in order to obtain the best results possible. Its condimental value, sharpening the appetite of the fowls, strengthening their digestive organs and insuring perfect assimilation, makes it indispensable to the poultry keeper who would get all the value he can out of his chickens, at the least possible expense. Do not forget to provide them with plenty of pure, fresh water. If Davis Poultry Food is not used, a little powdered charcoal should be given also. If sheaf wheat or oatmeal is fed in the morning, it will keep the fowls alert throughout the day and the noonday meal may be dispensed with. The mash fed by the poultry keeper referred to consists of cooked potatoes or vegetables, cut clover and beef scraps, all mixed in a crumbly mass with some bran, shorts, chop feed, and a little oil meal and salt. Remember that you must not overfeed the hens. Davis Meat Scraps may be fed with great advantage in the mash. Keep the poultry house warm and dry.

Breed Intelligently.—You should always remember that it is unwise to depend too much on any set rules or regulations. Have your eye on each member of the flock at all times, watch them closely, and suit the feed to their apparent needs. When the chickens are roosting at night pass your hand over them, feel their flesh, and judge of their condition. Any fowls not up to the standard, which have become beefy, lazy and laggard, should either be dieted or sent to the market at once. The sharp breast bone will always reveal the hen that is too poor and thin. Older birds are more susceptible to take on too much fat than the younger members of the flock. When warm weather sets in the heating of feeds should be dispensed with, or at least such feeds should be reduced in quantity at this season of the year. If the owner has his experienced eye on the birds it is unnecessary to be constantly worrying about correct rations, for he will soon learn the needs of his fowls and feed them accordingly. In judging of the state of a chicken, the droppings are a pretty sure guide. They should be of sufficient consistency to hold their shape, but not too solid. Their color should be dark, tapering into grayish and white. If the droppings are watery and dark, with red splashes of mucus in them, feed less meat and feed. If the droppings are soft and pasty and yellowish or brownish, feed more meat and less starchy feed. Greenish, watery diarrhea should always lead to a careful investigation of the sanitary condition of the feed and water. It should be looked upon as a danger signal, and never be allowed to go unheeded.

See that Each Member of Your Flock Comes as Nearly as Possible up to the Standard.—In the poultry business, as in any other branch of animal industry, ultimate success in a large measure depends on the quality of the stock, the perfection of each individual bird or animal, as it were. This question stands over and above that of feeding. A record of the best layers is kept at the Maine Experiment Station with the aid of trap nests. From the best hens will be raised both cockerels and pullets with the aim of building a strain remarkable for heavy laying. Some of the poor hens might have been picked out on sight as beefy and lazy in appearance, but in other cases the bad layers seemed as smart, well formed and vigorous as any. The trap nest is the only sure way unless each hen can be kept with a flock of another breed laying eggs of a different color. The Rhode Island Experiment Station conducted experiments in feeding which indicated that the ordinary rations given to laying hens which are locked up in yards throughout the molting season do not contain a sufficient quantity of animal feed material. Meat and green bone as furnished in Davis Meat Scraps and Davis Coarse Ground Bones was shown to be of the greatest importance, as it provides animal protein to balance the starchy grains. The New York Experiment Station made experiments regarding the relative values of whole and ground grains, and in the tests made use of two lots of laying hens, of small and large breeds respectively, having their grain fed only dry and whole. It was found that these ate more feed at a greater cost per fowl and for their live weight than did two similar lots which had approximately 37 per cent of their grain ground and moistened.

Two pens of Cochins of similar breed were tested, with the result that the one fed whole grain produced eggs at a much smaller cost than the one fed on ground grain. This result was attributed principally to the fact that a greater amount of exercise was required of the fowls in the feeding of the whole grain. On the other hand, a pen of Leghorns which throughout the year had 37 per cent of their feed ground and moistened produced eggs at a greater profit than did an exactly similar pen fed on whole grain. With the kinds of whole grain generally available it is not quite possible to feed so narrow a nutritive ratio as is perhaps necessary for the best results from laying hens—that is, one which contains as large a proportion of the nitrogenous feed constituents as is required. In adopting a ration consisting of such ingredients as cotton seed meal, pea meal, gluten feed, or other of the highly nitrogenous by products, together with ground grain, an excessive amount of meat may be avoided and the general ration narrowed without bad results. In case hens are fed similar rations, if the fowls of more diminutive breeds only produce the same yield of eggs as those of larger breeds, the eggs are more cheaply produced by the smaller chickens; but, when the cost of raising and ultimate poultry value of the fowls is taken into consideration, the profits will be the same in each case or even greater with the larger fowls.

The digestive apparatus in the chicken is quite wonderfully constructed. In the hen there exist three divisions or receptacles for feed. First, there is the crop, receiving the feed as soon as swallowed; then, a little farther back in the breast, is the gullet, which contracts and expands so as to form a second receptacle, with thick walls. Next we find the third receptacle, which is very muscular and large and is known as the gizzard. In starting, the gullet takes root from the back of the beak, runs along the neck, behind the windpipe, and ends in the abdomen, slightly to the left.

Overfed fowls that have become fat, drowsy, broody and droopy as a rule are poor layers, inclined to weakness in the legs, and, taken all in all, are rarely fit for anything but food. Do not feed such hens more than once a day, preferably in the evening. Let the meal be made up of a pound of lean meat to twenty-five hens, and scatter a handful or two of grain in the litter to keep them in constant exercise throughout the day. Davis Meat Scraps contain little if any of the fat producing elements in poultry feed, and may be used to good advantage if a sufficient quantity of lean meat cannot be procured at home, and they will constitute a less expensive feed. Spread a few grains in the litter at night and the hens, which have been kept hungry throughout the day, will be induced to hunt for them until a late hour. This will soon reduce and take off their fat, and their egg producing qualities will again begin to develop. If the hens after a week or fourteen days' diet on above ration commence to lay well, the one meal per day plan may be followed up. The one thing to bear in mind is to keep them in constant exercise until the fat is removed.

The Anatomy of Fowls is an interesting study. A short description of the digestive apparatus already has been given, and to this should be added that the large number of small stones swallowed by the birds are subsequently, upon dissection, found in the gizzard. It is claimed by naturalists that they hasten the operation of digestion by the contracting of the muscular lining, causing the stones to grind the feed, as it were. The third or last stomach is formed by a thick and very strong muscular membrane, the external fibers of which are of a tendinous nature. The internal membrane, which lines the gizzard, is very thin, fibrous and hard. A coloring matter, having the properties necessary to dissolve stones and carbonate of lime, is secreted from this membrane. Dissolving of flint is the longest process. Fluids partaken of as drinks seem to be absorbed by the first and second stomachs; at any rate they are never found in the gizzard unless in case of disease. In fowls the salivary glands are comparatively small. They secrete a minute quantity of a thick, slimy fluid. On the other hand, the liver is large, and is divided into two lobes of the same size. The bile of the gall bladder, which is attached to the liver, is thick and extremely bitter. Two small tubes from the pancreas pour a fluid into the intestines. The spleen is small, cylindrical in shape, and situated behind the liver. Its functions evidently are to keep in reserve and properly prepare the fluid which is used as one of the secretions necessary for the process of digestion. The circulatory apparatus is similar to that in other animals. The heart has four cavities and the arteries are the usual ones. In the picture presented on the following page the abdominal muscles have been abstracted, together with the heart, trachea, sternum, the greater portion of the neck, and the entire head

excepting the lower jaw, which is turned aside in order to bring the tongue into view, the pharynx, and the aperture leading into the larynx. The intestinal bulk, left lobe of the liver, succentric ventricle, and the gizzard, are pushed aside to the right in order to afford a plain view of the various portions of the alimentary canal, the ovary, and oviduct.

The Bodily Composition of Fowls also affords an interesting study for progressive farmers and poultry keepers. Like nearly all animal structures it is composed of more than half water. One hundred hens will require not less than 16 quarts of water per day, and care should be taken at all times to keep this water perfectly clean, cold and fresh. A pint of water is contained in each dozen eggs.

In regard to the grain per day approximately required by the average laying hens, it is estimated that each 1,000 pounds live weight fowls of ordinary size require from 65 to 70 pounds of grain per day. The average hens can on this ration generally be depended upon to lay from 16 to 30 pounds of eggs. It is possible to produce 1 pound of eggs from about $\frac{3}{4}$ pound of water free feed, 1 pound of dry matter of the eggs corresponding to each 8.8 pounds of the water free feed consumed. Forty to 50 pounds of grain per day, containing about $\frac{3}{4}$ pound of water free feed, is sufficient for the feed of each 1,000 pounds weight of hens of the larger breeds. In regard to the relative proportion of nutrients, distributed in the feed, 6 pounds of digestible protein, 14 pounds of digestible nitrogen free extract and 2 pounds of digestible fat will be found about right. The larger breeds of fowls require, when laying, about $4\frac{1}{4}$ ounces of feed daily. Chicks are heavier eaters than the older birds, and must be fed more in proportion to their weight than these. When very young 10.6 pounds to every 100 pounds live weight per day is generally needed. This ration may be diminished to 7.5 pounds when the chick reaches a weight of 2 pounds; 6.4 at 3 pounds weight; 4.9 at 6 pounds weight; and 4.7 at 7 pounds weight per day.

The above rations are for grain feed, it should be noted. Green feed and extras are an important adjunct to these. Davis Poultry Food, if added to the daily ration, will insure perfect health and the highest possible productiveness among the layers, and will decrease the feed bill from 20 to 30 per cent. It will pay for itself over and over again.

The Farmer and Poultry Keeper will do well in acquainting themselves with the comparative nutritive values of the various grains available for poultry keeping and feeding. Grains like Kaffir corn, milo, maize, durra, millet, chicken corn, etc., may take the place of wheat to some extent if the latter is scarce. Hulled broom corn seed ranks side by side with wheat as a ration for fowls. A number of the grains mentioned above are small and constitute a good scratching feed for birds and also may be used as chick feeds. Among the standard grains in the market corn is fattening and heating, but it should be balanced with meat, bone, bran, linseed, gluten, and similar feeds. Corn on the cob is valuable as a chicken feed for the farmer and provides some exercise for the fowls, while cracked corn, if it is fed dry, always should be sifted in order to prevent waste. Soured or overheated corn or meal should never be fed to the fowls, especially not to the young.

Wheat is generally looked upon as the best and safest grain feed for poultry, the only drawback in its use being that it generally comes higher in price than most of the others. If merely small, scorched

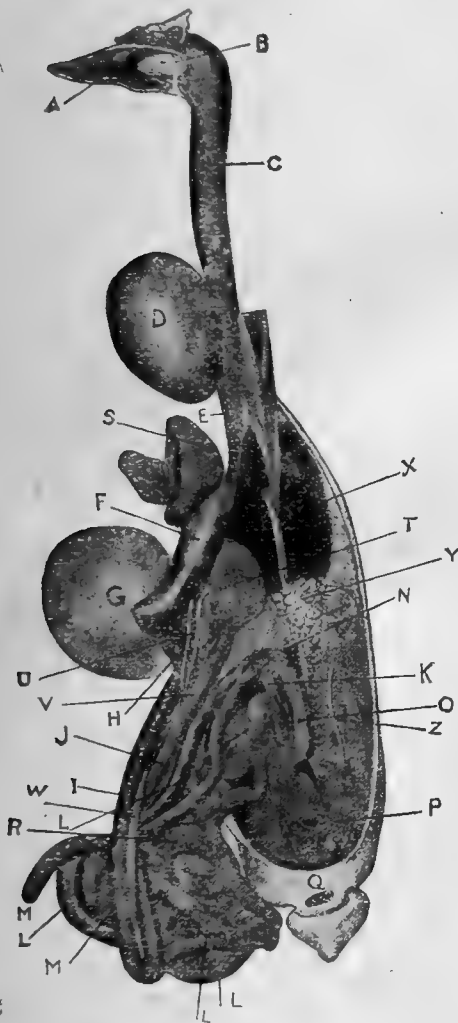


Figure 6. Anatomy of a Fowl.

- A Tongue.
- B Pharynx.
- C First portion of esophagus.
- D Crop.
- E Second portion of esophagus.
- F Succentric ventricle.
- G Gizzard.
- H Origin of duodenum.
- I Duodenal flexure.
- J Duodenal flexure.
- K Origin of small intestine.
- L Small intestine.
- M Free extremities of caeca.
- N Insertion of organs into intestinal tube.
- O Rectum.
- P Cloaca.
- Q Anus.
- R Mesentery.
- S Left lobe of liver.
- T Right lobe of liver.
- U Gall bladder.
- V Insertion of biliary and pancreatic ducts.
- W Pancreas.
- X Lungs.
- Y Ovary.
- Z Oviduct.

or broken No. 2 wheat is bought and selected with care it often will be found to contain almost equal feed value with the No. 1 grain. Sour or burned wheat, however, is always to be religiously avoided, and in feeding screenings it should also be remembered that these contain as a rule a number of seeds not eaten by the birds. Middlings, shorts and bran, fed with corn meal, constitute a good feed, but if fed alone they are not relished by the birds and practically wasted. If the poultryman is located near bakeries, he may, with good profit, secure and feed his fowls and chicks with the waste from the bread, which, when soaked and mixed with middlings, makes an excellent feed.

Oats, while it cannot be considered to constitute a vital part of the menu provided for up to date poultry, still should always be on hand and fed for the sake of variety. It is not so well liked on account of the husk. When it is clipped, however, it is much relished and there is hardly anything better for the production of superior eggs. Rolled oats and coarse oatmeal constitute excellent chick feeds and may be fed dry. Oats as a whole are nearly as nutritious as wheat and serve to offset corn and other grain feeds.

Buckwheat is generally relished by fowls and is of a fattening nature; but, apart from localities where it is being raised at home or where its price is low, it is comparatively little used. The middlings of buckwheat constitute a good feed when mixed with corn meal and are especially rich in egg material. Rye bran contains the same qualities, but if fed too freely it is claimed by poultrymen that it is apt to produce bowel trouble.

Barley contains much the same qualities as wheat, but as a rule the birds do not like it very well. As a nutritive ration barley shorts are exceptionally valuable. Unless its price is low it is not advisable to feed barley to any extent.

Davis Poultry Food.—In the summing up of this little treatise on broiler growing and the general care and feeding of chickens, in accordance with the most approved, up to date methods, we desire to again call the progressive and economical poultry keeper's attention to the merits possessed by Davis Poultry Feeds. In them are contained in nicely balanced ratio all the elements that go to make up the composition of the egg, and they will supply materials absolutely necessary to the laying hen if she is to produce a satisfactory number of eggs of standard quality and flavor, or if she is meant to be fattened for the market. Davis Poultry Food is of a condimental nature, containing roots, herbs, seeds and barks, and when fed to the birds in their regular daily ration it has an effect approximately the same as condiments for human consumption produce upon our own food, which cause a greatly increased activity of the digestive organs, a more abundant flow of digestive juices, a keener appetite, and, consequently, a more perfect assimilation of the feed consumed. And this means to the prudent and careful farmer a saving in his feed bill of from 20 to 30 per cent, actual value, as can easily be ascertained by giving them a trial in accordance with the suggestions given in the foregoing pages.

If for any reason the poultry keeper should not care to invest in outside poultry foods, he may find, to some extent at least, a home substitute for them in the following (when forced production of eggs is desired), made up of ingredients which can be purchased at the drug store: Cantharides, 90 grains; ginger, 36 ounces; venetian red, 2 ounces; sulphur, 3 ounces; charcoal, 5 ounces; capsicum, 16 ounces; oil meal, 30 ounces. The whole combination should be finely ground and mixed well together. Use one and one-half teaspoonfuls to the quart of hot mash, which will be enough for twelve birds of average size. The whole preparation should not cost more than 60 cents, but it should be remembered that apart from the forced egg production, causing the pullets to lay earlier, there is no profit in its use. Experiments have demonstrated that it will not in the least increase the yearly yield of eggs. With the use of Davis Poultry Food preparations it may easily be altogether dispensed with. And let it be understood that the foregoing formula is a stimulant and not a tonic. Davis Poultry Food is a tonic and digester, and increases the yearly egg production.

SPECIAL FEEDING.

Many farmers who are in the habit of keeping a large flock of poultry feel the high prices of the standard grains used for the feeding of their fowls. And this is the reason why the question is being asked again and again if it is not possible to find a substitute to take the place of the costly grain ration. In considering this question it should be remembered that as poultry is usually confined in comparatively close quarters, it is not well to feed the fowls too bulky or coarse feed, such as the ruminating class of domestic animals may safely partake of on account of their greater liberty. However, a judicious and liberal use of vegetables, apples, clover, etc., may with good results be substituted for the grains. But under these circumstances the farmer must also eliminate the feeding of wheat bran to any extent, as this is altogether too heavy and bulky a feed to go with the green ration. In feeding the regular mash to the birds, vegetables, either green or boiled, may be mixed therein. Finely cut clover or alfalfa, also clover meal, may be steamed and mixed with the mash, and a good ration for the noonday meal is steamed clover, to which has been added a suitable amount of corn meal and wheat middlings. Davis Meat Scraps, Davis Meat Meal, and Davis Coarse Ground Bone are exceedingly cheap, when the highly nutritive matters which they contain are considered. Barley is at times a most economical feed to use, and may be given to the birds either whole or ground. Corn silage is cheap and especially relished. It should be fed occasionally. Once a day, at least, whole grain should be fed.

An Important Part in the proper ration of poultry is supplied by the animal matter consumed. Indeed, it is safe to assert that but few poultrymen realize how conducive to the health and well being, stamina and productiveness of his flocks, are the numerous insects, worms and other living organisms picked up by them during the day. This fact was strikingly brought out a little while ago by the experiments conducted by the New York Experiment Station that we have previously mentioned but which we repeat here, as we deem them worthy of repetition. Two lots of chickens, closely resembling each other, were employed in these experiments. Of these one lot in each case was fed a ration consisting of mixed grains, skim milk or curd, containing no animal matter whatever; the other ration was made up of mixed grains with animal meal and fresh bones or dried blood. The two rations were balanced equally well, with the exception that the animal matter ration contained slightly less protein than the vegetable matter ration. The material difference in the two rations consisted in that in the one case two-fifths to one-half of the protein originated from animal sources, while in the other the entire amount was derived from vegetable sources.

Two separate trials were made with chickens, and as a result it was proved that while in each case more feed was eaten by the lot fed on animal protein, there was a more rapid and pronounced gain in weight, leading to an earlier maturity, the cost of gain was less, less feed being required for each pound of gain. This is in itself an elegant illustration of the great nutritive value contained in Davis Meat Scraps, Davis Mixed Poultry Feed, and Davis Coarse Ground Bone, and clearly demonstrates the great saving which may be made through a judicious and constant use of these feeds.

Continuing with the experiment made by the New York Station, it was found that during the first twelve weeks of the first trial (starting in with the one-half week old chickens) the chicks fed on animal meal gained 56 per cent more than those on the vegetable diet, notwithstanding the fact that they ate but 36 per cent more; for the gain of 1 pound they required $\frac{1}{2}$ pound of dry matter less, and each pound of gain cost but $4\frac{1}{4}$ cents, while that of the grain fed fowls was 5 1-5 cents—a telling argument in favor of the animal matter ration.

Passing over to the next eight weeks, the cost of gain was found to be respectively $7\frac{1}{2}$ cents and 11 1-5 cents. The chickens fed on animal meal reached 2 pounds in weight more than five weeks before the others; they arrived at 3 pounds more than eight weeks sooner, and four weeks earlier than any of the grain fed birds three pullets of the lot began laying.

The correctness of the indication made by the first experiment was further enhanced by the second trial, showing respective differences in the same direction. The second test was made with six weeks old chicks, and proved that the great advantage of animal nitrogen lies in the promotion of a quick, healthy growth and an early maturity rather than increasing the fattening tendency.

In the case of ducklings fed on the same contrasted rations, the results were almost startlingly convincing. The experiment had only progressed a short way when attention was drawn to the fact that the fowls fed on animal meal matter developed evenly and rapidly, while the ducklings fed on grain only became thin and uneven in size. So marked was this that it was almost pitiful to observe the long necked, scrawny, grain fed birds, who, although the troughs before them were filled with good, seemingly wholesome feed, were constantly straining their necks and scrambling over each other in hot haste to get away with the unlucky grasshopper or fly which happened to come near their enclosure, while the contented looking meat fed ducklings basked lazily in the sun and paid scant attention to the humming bee or crawling beetle. To make a long story short, the meat fed birds lived and thrived and looked happy and contented, while the vegetable fed birds one after another dropped off, starved to death, so it seemed, by sheer lack of animal feed, and only twenty of the thirty-three used in the trial were alive at the end of the fifteenth week of contrasted feeding. Then, as a further experiment, they were fed for four weeks on the meat meal ration, and made nearly as rapid gains as the other lot of the same size two months before. Their start on the exclusive grain ration, however, had put them so much to the bad that they never quite overcame its disastrous effects.

From the above experiment we may then deduct the inference that rations in which from 40 to 50 per cent of the protein is made up of animal matter, will give better and more economical results than such rations as draw the greater part of their protein from vegetable sources. In the experiment mentioned the main advantage was found to lie in the production of rapid growth and satisfactory development, although the cost of production was also in its favor. Inferior palatability undoubtedly had something to do with the marked differentiation in results, especially in reference to the ducks, but, taken all in all, the chief inference to be drawn from these experiments and others not yet reported apparently indicate that the superiority of the one ration over the other is due to the animal feed contained therein. No better argument than the foregoing can be found for the constant use of Davis Meat Scraps, Davis Beef Scraps, Davis Coarse Ground Bone, or Davis Prepared Meat Meal. These all contain or are made up of animal matter of the highest feeding value, and are scientifically prepared in our extensive laboratories, combined so as to contain the various elements necessary for the nutrition and growth of animal life. The meat and bones used in their preparation, it may be added, are absolutely fresh, pure and untainted, and the prudent farmer who adopts the steady use of these feeds in accordance with our directions will be amply rewarded by seeing his poultry thrive and grow, and gain in life and vigor until his pens and yards are filled with valuable, beautiful fowls, pleasing alike to the eye and making dollars for their owner by their increased worth as broilers and layers.

Ducklings, as well as other fowls, need meat or animal feed in some form. Thus, for instance, one of the oldest duck raisers in the country feeds one part hard boiled eggs and three parts of stale bread crumbs the first three or four days, which ration he thereupon changes into one consisting of equal parts of wheat bran, corn meal and boiled potatoes, with a small percentage of Davis Beef Scraps added to each meal. Another large duck raiser feeds equal parts of corn meal, wheat middlings, bread crumbs or crackers with green feed for the first week. He then changes the ration into one consisting of four parts corn meal, two parts bran, one part middlings, one part Davis Beef Scraps, and four parts green feed. Each quart of the mixture is supplied with a handful of sharp sand, or Davis Cubical Grit; and plenty of fresh air, and pure, clean water is allowed the ducklings at all times.

Grain has been used hitherto to an almost exclusive extent, for the simple reason that it was easier to obtain. It is, however, a fact that bone is far superior to grain as an egg producing material, and it will be found that by buying the Davis preparations it will be much less expensive than the costly grain rations, and a saving of from 15 to 20 per cent will go side by side with the enhanced egg production. It is estimated that if the farmer can get only two extra eggs per week from its use during the winter, he will make a handsome profit; also that one extra egg per week will pay for all the feeds consumed by

the fowl. It is therefore easy to calculate that the feeding of Davis Poultry Food will pay for itself over and over again. It is often the case that poultry is well taken care of, receiving a sufficient quantity of feed, but not of the kind that goes to increase the egg production, but the prudent and progressive poultry keeper will know that to feed his flock on egg producing material, such as is contained in the Davis preparations, is the way to make his business pay.

One pound or so of Davis Coarse Ground Bone per day will suffice for from fourteen to sixteen hens, and the cost is insignificant. In cases where the birds have a free run of the yard, 1 quart of grain at night and 1 pound of Davis Egg Producer and Davis Coarse Ground Bone, ought to be sufficient for sixteen to eighteen hens, and no other meal need be fed during the day. In the warm season, when insects and worms are plentiful, only the bone need be fed. A ration of this kind provides fat, nitrogen, lime, starch, phosphates, and all the substances required for egg production. With eggs generally selling for 3 cents each in winter, it will be seen at a glance that a great saving may be made by feeding the Davis Prepared Feeds instead of ordinary grain. Davis Coarse Ground Bone is cut to the required size and is ready for consumption when received by the poultryman. No bone cutter or any other machine is necessary to prepare it. All you have to do is to take it from the bag and feed it to the poultry in accordance with the directions accompanying the shipment.

The Ohio State University made an interesting experiment to determine the value of green bone, mixed with oyster shells and gravel, as a ration for the laying hens. The trial was separated into four divisions with two pens in each division, one of pullets and one of old hens, ten to each pen. The first of those divisions was fed on green cut bone, gravel and crushed oyster shells, the second was fed on green cut bone and gravel, the third crushed oyster shells and gravel, the fourth gravel only. In the first instance the ten pullets laid 140 eggs, the ten hens, 64, making a total of 204; in the second pullets, 115, hens, 80, total, 195; in the third pullets, 79, hens, 4, total, 83; in the fourth pullets, 52, hens, 13, total, 65.

At the trial the first division received 14 pounds of raw cut bone, 2 pounds of oyster shells and as much gravel as they would eat. The second division received 14 pounds of raw cut bone and all the gravel they would eat. The third division received 6 pounds of oyster shells and gravel. The fourth division received nothing but gravel. Counting bone at 3 cents per pound and shells at 2 cents, the fowls fed on cut bone ration more than doubled in value of eggs. There was enough difference in those fed shells to more than pay for the shells, but left a narrow margin when fed with bone, while those fed bone more than doubled on those that were fed nothing but gravel, or by the test 20 cents per pound could have been paid for the cut bone, while eggs brought 25 cents per dozen. The hens that received the bone also possessed a much better plumage and wintered much better. It was in conformity with absolutely reliable, scientific experiments of this nature that Davis Poultry Foods, in their various forms, came into existence to supply a long felt want in this direction and enable every progressive raiser of poultry in the country to obtain the highest possible value from his fowls at a minimum expense. As soon as every raiser of fowls has had an opportunity to test the merits of these preparations and satisfy themselves that our claims for them are based on simple truth and facts, we are confident of their patronage and expect that in the course of a few years we will be able to build up the largest business of this kind in the world.

As bone is a highly concentrated and nutritious feed it should not be used carelessly and indiscriminately if the best results are to be obtained. In overfeeding lies the only possible danger or in feeding that which is sour or moldy. The first results in forcing the chicks or fowls off their feed, and in leg troubles; the other in diarrhea and bowel complaints. Full directions for the use and preservation of Davis Animal Foods are, however, sent with every shipment, and if the keeper will but follow them implicitly no troubles of any kind will be encountered.

It should be added here that the use of Davis Coarse Ground Bone, Davis Raw Bone Meal, Davis Meat Meal, etc., not only increases the production and quality of eggs, but lessens the feed cost of eggs. This has been demonstrated in the preceding pages, but deserves to be emphasized and further enlarged upon. It is a fact that from 15 per cent to 20 per cent of actual feed is saved by its use. In this connection it is interesting to note an experiment which a few years ago was made at a private experiment station in the State of Massachusetts. In it were employed two lots of pullets and hens, each of them

containing nineteen fowls, and lasting seventy-nine days. The feed for the first lot in pounds was as follows: Whole wheat, 99.5; oats, 100; wheat bran, 18.5; ground clover, 18.5; wheat middlings, 18.5; Chicago gluten meal, 18.5; green cut bone, 10; total, 283.5; cost, \$3.25; nutritive ratio, 1 to 4.8. The second lot received essentially the same feed, with the exception that in place of the green bone it was fed 9.7 pounds of animal meal. The total feed amounted to 287 pounds, the cost of which was \$3.26; nutritive ratio, 1 to 4.9. The lot fed on green cut bone laid 269 eggs at a cost of 0.940 pound dry matter in feed per egg and 1.2 cents for feed consumed, while the second lot laid 145 eggs at a cost of 1.796 pounds dry matter and 2.2 cents for feed consumed. The cost of labor for cutting the bone was included in this. This additional expense, of course, is not present with the use of the Davis Prepared Feeds.

Very much the same results were arrived at in other and more recently conducted experiments carried out at the New York Experiment Station. In these it was demonstrated that for laying hens the ration containing animal feed was superior to others in which all organic matter originated from vegetable sources. The fowls fed green cut bone laid more eggs and at a less cost per egg for feed consumed. Pullets raised on feed containing a considerable quantity of bone started laying much earlier than those fed corresponding rations made up of vegetable feed. It is of the utmost importance that this point be brought home clearly and forcibly to poultrymen and farmers. The difficulty of getting late hatched pullets started to lay eggs before the cold weather set in is well known. But once get them laying, and with good feed, care and warm quarters, they will go on laying well during the late fall and early winter, at the season when eggs are highest in price; while, on the other hand, if they cannot be started before the holidays it is almost impossible to get any profit out of them before toward spring when every other hen and pullet starts laying and the price of eggs goes downward in leaps and bounds. By feeding Davis Coarse Ground Bone, Davis Raw Bone Meal, Davis Beef Scraps, or Davis Meat Scraps, with Davis Poultry Food in the proper proportion, you will be sure of having your late hatched pullets commence laying in the fall. Any and all of the above mentioned preparations are good. And they are as inexpensive as they are good. They will pay for themselves over and over again.

It has further been demonstrated that for the raising of young ducks and chicks Davis Raw Bone Meal is incomparable. Nothing, in fact, has been found that will equal it for the speedy putting on of growth and weight both in chicks and ducklings. Without an abundant supply of animal protein in the ration the little fellows evidently are unable to even approximate their normally rapid and most profitable growth. A liberal allowance of vegetable matter should, of course, always be given with the ration. Feed the whole ration to them thoughtfully and intelligently, observing carefully its influence upon them from day to day.

Davis Raw Bone Meal, Davis Coarse Ground Bone, Davis Meat Meal, Davis Beef Scraps and Davis Meat Scraps are all prepared from strictly fresh, pure and untainted meat and bones, combined in the proportions which have been found to be most conducive to the sustenance, growth, development and enhanced value to the owners of poultry of all kinds. Expert chemists are employed in our large laboratories the year around to see that the feeds are perfect in every respect. In this way we are enabled to offer to the consumer, the enterprising, up to date American poultry keeper and farmer, an ideally prepared feed, the name of which we want to make a household word with every poultryman. We wish to obtain your confidence and patronage by offering you something honestly good, and we trust to you that, as soon as you have demonstrated to your own satisfaction that it is all that we claim for it, you will recognize merit by not only giving us your own trade, but by recommending the Davis preparations to your friends and acquaintances. Try it at our expense, and judge for yourself of its merits. If it is not all that we claim for it, write us and we will return you your money without argument or question.

The West Virginia Experiment Station some time ago conducted an experiment for the purpose of comparing the value of bone and meat meal for egg production. The results were very much in favor of the green bone.

In the course of a period of four months, beginning October 25th, seventeen Plymouth Rock hens fed the fresh bone laid 650 eggs of an average weight of 11.75 pounds per hundred. The fowls which were fed fresh ground meat and bone also increased more in weight and were much healthier during

the experiment, four of the others having died, and being replaced by others. As this experiment was made with only one sample of meat meal the results cannot be considered absolutely conclusive, but new evidence along this line is all the time coming in, and it is safe to assume that when the value of proper feeding is fully recognized, substantiation of these experiments will come in from so many different quarters that there will no longer be room left for any doubt in the mind of the poultryman and farmer.

In the following we shall endeavor to give an idea of the comparative values of the different feed-stuffs suitable for poultry raising, in the form of milk and vegetables, which are usually available on the farm:

Whey Cream.—Given in moderate quantities with other feeds this constitutes a most valuable poultry feed. It is eagerly sought and relished by growing chicks, and may be used regularly as an adjunct to their diet. Experiment has shown that it gives an exceedingly sweet and tender flavor to their flesh, and that the objection that it makes their meat oily in taste is not well founded. Doubtless if chickens are kept in close confinement and fed largely on this waste cream a marked oily flavor to their meat may be brought about, but this is not the case if the diet is suitably mixed and the birds have a free run of the yard. As it is waste matter that costs comparatively nothing, its utilization in this direction is a most profitable one. It is well known in cheese manufacturing districts that all of the cream from sweet milk cannot be worked into full stock cheese. And the resulting percentage of necessary waste, rising in the whey tub, and which usually is fed to the hogs or used as cheese dressing, is recommendable as an adjunct to the feed ration of growing chicks.

Bulky Feed.—As is the case with almost every species of domestic animals, poultry must be fed a suitable percentage of bulky feed. It is not alone on account of the respective nutriments they contain that such feeds are valuable, but they serve to distend the crop and assist the fowls in extracting the nutriments from the condensed feeds partaken of. As suitable for the bulky feed ration may be mentioned finely cut grass and clover. These have a greater feed value than their analysis indicates in reality. If the birds are fed upon such feeds in connection with Davis Poultry Food and the regular ration of more condensed feed, the habit of feather pulling will rarely be contracted. This habit evidently is mainly ascribable to two causes, foremost among which is lack of animal matter, while lack of bulky feed takes the second place in importance. It is safe to say that feather pulling would hardly be known at all if these two elements were fed regularly, unless perhaps it was introduced to the flock through some vicious individual that, for want of the two feeds mentioned, had originally become infected with the malady. Even after the habit is contracted such feeds will frequently overcome it if persisted in.

Skim Milk.—In the world of poultry it is practically only the hen that may be fed skim milk with profit. Most of the other varieties are averse to it. But it is a fact that 100 pounds of skim milk, fed to laying hens, will make as many pounds of egg, or, fed to broilers, as many pounds of poultry, as it will of pork or veal.

Green Feed.—The value of green feed for laying hens was strikingly shown in an investigation made by the West Virginia Experiment Station. Forty White Leghorn hens and four cocks were divided into two flocks of equal size and placed in two houses, side by side, in the middle of July. Runs, 15 feet wide and 100 feet long, were allowed to both flocks, and both had access at all times to such grass and herbage as grew in the runs. An abundance of green feed was given to one of the flocks in addition to the regular ration. The result was that at the end of the year the birds provided with the green feed had laid two dozen eggs more than the other.

Special Feed Crops.—There are a number of greens and vegetables which will prove of special value and largely conduce to the health and growth of chickens if fed in suitable quantities together with the grain and animal matter ration. Young lettuce and onions ought to be grown and kept by every farmer for feeding purposes. Chop them moderately fine and the birds will relish them. Well cooked beans, either whole or ground, is a good article to add to the feed list. Seeds of the common millet, golden millet, sorghum and broom corn will also help to variate the list of good, inexpensive feeds. Young chickens relish rape seed. It is easily raised, and will prove useful and valuable. Equally valuable for young fowls is Egyptian corn, a species of sorghum or akin to this plant. Tobacco ought also to be raised, and used to keep the birds free from vermin.

Clover Run.—One successful poultry raiser is in the habit of sowing crimson clover in the pasture or run for his poultry. The land set apart by him for market produce lies in close proximity to the poultry yard, and his method is to sow crimson clover as a catch crop between the rows of garden vegetables. Then, after the vegetables are gathered, he allows the birds the range of the field during seasonable weather, in the course of the late fall and early winter when the other grasses do not supply green feed for them. It seems that crimson clover is especially adapted for this purpose, as, contrary to other clover, it remains green after the hard frost of early winter. A little rye, sown in with the clover, will be found of assistance, helping the clover in enduring the cold, if the weather in your section is severe, and the rye will survive if the clover should be killed by the frost. You will be in a fair way to make a good profit on the hens next winter if you provide them with such a run now, and at the same time dry and put away some of the clover rowen for future use.

Mangels.—This beet, with little care, yields an enormous crop in comparison with the ground taken up in its cultivation. It is easy to harvest and may be kept throughout the winter with little difficulty, either in the cellar or in ordinary pits. A good way is to feed it raw, and if the beet be split from crown to foot the chickens will enjoy picking out the inside. It may also be cooked and mixed with the other steamed or cooked feeds.

Rice.—One poultry keeper, formerly of California but now located on the Hawaiian Islands, records interesting experiments made by him with a milk and rice diet. For ten years he was engaged in raising poultry for market both with hens and incubators while residing in California. He had trouble with young chicks during this period, more or less diarrhea manifesting itself now and again and making inroads on his flock. Now, since he came to the islands, he makes a practice of feeding the chicks on broken rice and milk, and never has had a case of diarrhea or a sick chick, although he is obliged to keep them in close quarters on account of the mongoose. Of course they are kept clean at all times, but until fully grown are always confined inside a wire fence. He asserts that if he had known the value of rice as a feed while in business in California he would have been several hundred if not thousands of dollars in pocket now.

Onions cannot be recommended as a feed for poultry, as they will quickly affect the flavor of eggs. Turnips also will communicate their peculiar pungent and disagreeable taste and smell to the flesh and eggs of poultry, as they do to milk and beef. They will taint the meat, and when it is cooked it will emit a pronounced smell of turnips. Muskrats will likewise affect the quality and flavor of eggs or meat, making it musky and repulsive, and the meat of these animals should not be fed to chickens.

Nuts.—If an abundance of nuts are produced on the farm, more especially butternuts and black walnuts, they can be turned into profit when fed to the poultry. They should be cracked rather fine, when the hens will pick the shells clean in a short time.

Odds and Ends.—The leavings from the table are excellent chicken feed, as they generally include vegetables, meat, etc. The bones which the farmer's table yields in the course of the year, when ground or chopped fine, yield a feed of almost equal value to Davis Meat Scraps and Davis Raw Bone Meal, and may be fed to the fowls in equal proportion with good results.

Mixed Feedstuffs.—A good egg feed may be found in old and damaged cheese, useless for other purposes. A cheap and valuable feed, equal in value, pound for pound, with raw corn, is contained in popped corn from the factories. If the corn is sugared, so much the better for fattening. Bakery refuse, such as bread, cake and crackers, makes good feed for chicks and will take the place of many pounds of grain. Very often scorched grain can be obtained for about two-thirds of the standard price, and may be advantageously used if it is not so badly burned that part of it will be left on the ground. Grain screenings are of questionable value for birds, but chicks will eat most of the seeds they contain.

Gluten Meal.—This is manufactured from the chit or nitrogenous elements of the corn grain, constituting the refuse from ordinary corn starch. Nearly 30 per cent of nitrogenous matter is contained therein, while the pure corn meal holds only about 9 per cent. Very rich, and valuable in the mixed ration, are cotton seed and linseed meal, although they are of course quite different articles from gluten. Cotton seed meal contains about 40 per cent of nitrogenous matter, and linseed meal 30 per cent. There are two kinds of linseed meal, namely, the old and the new process. Of these the new process linseed meal, if carefully and judiciously fed, may be used without bad effect for the purpose of increasing the egg

production, while the old process, which contains 10 per cent of fat or oil, is too fattening for the laying hens. This constitutes the principal objection to cotton seed meal, which contains 12 to 13 per cent of fat, while gluten meal holds no more than 5 per cent of oil. If the proper care and judgment is employed either of these concentrated meals may be advantageously used as poultry feed, provided Davis Poultry Food is fed regularly. It is advisable to start in feeding either of them in very moderate quantities and by degrees increase the ration, as judgment and experience permit it. They should, however, never be fed alone, being too concentrated and rich, but other feedstuffs should always enter largely into the ration.

Cider Pomace may be made to serve the same purpose as green feeds, roots, herbs, clover, etc., during the winter months. The fowls will partake of it freely, and the cost will be smaller than if green feeds were provided. Hogsheads or tight barrels are suitable for storing the pomace in. Fill up the barrels and press down the contents firmly with jackscrews or barrel headers, making a solid, compact mass.

Sour Feed is not recommended, as it induces bowel trouble. Remove any such feed from the presence of the fowls. Feeds that have a tendency to sour quickly should not be left about. Feed only as much of them as may be consumed within twenty minutes or half an hour.

Garbage.—If well cooked and fed with ground feed, garbage from village and city swill may be given once a day to the fowls without injury. There is no objection to feeding it as long as the hens thrive and remain in good health, but too large a quantity should not be given at any one time.

DRESSING AND PACKING POULTRY FOR SHIPMENT.

In the poultry industry, as in every other, attractive marketing is an important feature, and one too often overlooked. Many of the products marketed by the farmer do not realize high prices owing to a lack of proper packing, or because some special requirement of the consumer is not complied with. The Canadian Experiment Stations have devoted considerable attention to the poultry industry. Special efforts have been made to learn the requirements of the English market. In a recent report of the Canadian Commissioners of Agriculture and Dairying, the methods of dressing, packing, and shipping poultry for British markets are discussed. Some of the directions for shipping turkeys seem of general application. Among the principal points are the following:

Plucked turkeys are regarded as more salable than unplucked. Fast the birds for twenty-four hours, to empty the crop and intestines. The fermentation of feed in the crops and intestines will wholly spoil the birds. Give a small quantity of water just before killing. Kill by wringing the neck, and not by knifing or sticking. One dealer says the easiest and best mode of killing is by the dislocation of the neck. This manner of killing is generally adopted by the English and continental poulterers. It is done as follows: Grasp the legs of the bird in the left hand and the head of the bird in the right hand, the back of the bird being upward and the crown of the head in the hollow of the hand. Hold the legs of the bird against the left hip and the head against the right thigh or knee. In this position strongly stretch the head, at the same time bending it suddenly backward, so as to dislocate the neck near its junction with the head. The bird is killed instantly, and plucking the feathers must be proceeded



Figure 33.

with at once. The method of killing turkeys in Norfolk is also recommended. It is as follows: The bird is hung up by the legs, the wings being crossed to prevent struggling. Next it is given a sharp blow on the back of the head with a stout piece of wood, which renders it insensible. The knife is then

inserted into the roof of the mouth, so as to pierce the brain, cutting it along the entire length. The bird is left hanging by the legs for a few minutes to allow the blood to drain out. Pluck at once while still warm. Feathers should be left on the neck for about 3 inches from the head; also a few feathers on the tail and tips of wings. Do not tear the skin in plucking, and do not under any circumstances dip the bird into water. Remove the intestines from the rear. Care must be taken not to break the gall bag. All the rest may be left inside. Twist the wings on the back of the bird (Figure 33). A string, which, however, should not encircle the body, may be used to keep them in place. As soon as the feathers are off hang the bird up by the feet to cool. Do not lay it down or hang it by the head.

The blood should drain toward the head, and become coagulated there. One dealer says to lay the birds on their breasts on a setting board, pressing the rumps square, letting the heads hang down until the body is set, when the birds will always retain their plump shape. Cleanliness is necessary. The feet and legs of the birds should be clean also. The legs of the dressed birds are often tied up as shown in Figure 34. If the birds are to be displayed in a shop the head should be pushed up under the wing. The birds should be thoroughly cooled (not frozen), and they should be cold through and through before being packed in cases. Pack in any one case only birds of nearly the same weight, graded to within two pounds. In no case should any bird be lighter than the lightest weight or heavier than the heaviest weight marked on the package.

Pack the cocks and hens in separate cases. Mark the cases at both ends plainly. Wrap every bird neatly in paper. The head of each bird should be wrapped with a quantity of thick paper, to absorb any blood. Spread a small quantity of wood pulp or dry, clean straw in the bottom of the case. Put paper on the bottom and top of the birds to keep them clean. A small quantity of wood pulp, or dry, clean straw may be put on top, directly under the cover. Pack the birds with backs down, with heads at one side. Put from twelve to twenty-four birds in a case. Every case should be packed quite full and close, to prevent damage during transit. Do not export any old, tough birds. Every bird should show a good, plump, white, broad breast.

Opinions differ in the United States regarding the practice of drawing poultry before marketing. While it is desirable to suit the demands of the market to which shipment is made, the following conclusions from recent American experiments are of interest:



Figure 34.



Figure 35.

Under precisely the same conditions of temperature and humidity, drawn fowls will keep from twenty to thirty days longer than those not drawn. The presence of undigested feed and excrementitious substances in animals which have been killed most certainly favors tainting of the flesh and general decomposition. The viscera are the first parts to show putrescence, and allowing these to remain within the body cannot do otherwise than favor infection of the flesh with bacteria and ptomaines, even if osmosis does not actually carry putrid juices to contiguous tissues. Hunters know the value of drawing birds as soon as possible after they have been shot, in order to keep them sweet and fresh and to prevent their having a strong intestinal flavor.

That the opening of the body of an animal and exposing the internal surfaces to the air may have some influence of itself in hastening putrefaction is admitted, but when the process of drawing is properly conducted this secondary objection to its immediate performance may be entirely set aside. Absolute cleanliness should be maintained throughout the operation, and if the entrails are torn and their contents allowed to come in contact with the flesh of the animal its interior should be at once washed out with clean, cold water and afterward with a solution of common salt and the carcass hung up until thoroughly dry.



DISEASES OF POULTRY.

Common Causes.

For the proper treatment of disease it is essential that the poultryman should have some idea of the most common causes. Should the digestive organs be affected, the feed, its character and quantity, should be first looked into. See that the birds are given opportunity to exercise properly, assure yourself that they have had the necessary grit, or whether the alimentary canal is obstructed at any point. Find out whether or not they have been exposed to cold or drafts of air, and, last but not least, assure yourself whether or not they have been subjected to the attacks of the numerous parasites, both animal and vegetable, that are known to cause disturbance of the digestive tract. Diseases of the respiratory organs may be caused by chills, by exposure to drafts or a damp atmosphere, and they may also be caused by minute organisms or parasites. If the skin or feathers are affected, look for parasites; in cases of lameness, it is possibly due to injury by rheumatism. If the fowl is pale around the head and there is a general loss of weight, it is probably caused by indigestion, by improper feed, or by the attacks of internal and external parasites. Diseases of the brain may result from exposure to too great heat, from sunstroke, from overexertion, high feed or insufficient exercise. Diseases of the ovaries may be the result of the bird being too fat, or from the ration being improperly digested for the needs of the body.

Hygienic Requirements.

The hygienic and sanitary surroundings are particularly important in fowls, much more important perhaps, than in quadrupeds. When we stop and consider the matter we find that the reason is that birds digest more feed in proportion to their weight than any other animal. Not only that, but they breathe more rapidly, their blood circulates faster, their temperature is higher, and they make a greater proportionate increase in body weight in a much shorter time than other animals. On the top of all this the bird of today may be rightly compared with a very complicated and delicate machine, run under extremely high pressure, which, if neglected, soon goes to pieces. In this connection we will refer the poultryman's attention to our chapter on houses, etc., and strongly advise that they be followed.

Disinfection.

The word disinfection means to destroy or remove infection in the way of vegetable or animal parasites, microbes and foul odors. As we have repeatedly stated, prevention is better than a cure, and too much attention, therefore, cannot be given toward keeping the fowls in clean surroundings. The longer chickens are kept on the same premises the more the parasites will increase and therefore the greater will be the danger. Systematic and thorough measures should be adopted, and they should be attended to with religious regularity. The methods of disinfection are many. Some are dangerous and some are inefficient, and it is therefore important for the poultryman to thoroughly understand those which are most efficient and least dangerous. For the inside of the house, including the roosts and nests, hot whitewash should be used at least twice a year, and we strongly advise adding to this whitewash Phenalin, manufactured by the Davis Stock Food Company. The Phenalin should be used in proportion of 1 quart of Phenalin to 30 gallons of whitewash, the Phenalin being mixed with the water before it is put on the lime. There are a great many good preparations on the market, but Phenalin is better than the majority. It is much stronger and absolutely safe. Should the poultryman not have it on hand, carbolic acid will do very nicely, but it is not so strong as Phenalin, and more dangerous. Where houses

that have been whitewashed need to be disinfected again we advise spraying the ceilings, walls and all the crests of the house with a 2 per cent solution of Phenalin. For external parasites there is nothing better than Dr. Brown's Lice Killer, applied to the roosts, or the fowls may be dusted with Brisbane's Death to Lice. The runs used by the fowls should be plowed and replanted often, in order to bury the accumulated excrements and parasites and bring fresh soil to the surface.

In spite of all these precautions intestinal worms will at times develop, and it is in such cases as this that Davis Poultry Food proves its efficiency and value. If used regularly there will be much less danger from internal parasites, and the cost is practically nothing, being less than 1 cent a month for each fowl.

Simple Catarrh.

This is one of the most common diseases of fowls. The attacks may be mild and affect but a few birds of the flock, in which case it is easily overcome. Again, severe attacks that will affect nearly all the fowls in a flock, and which will yield only to heroic and prolonged treatment, may occur. In such cases it is important to make a thorough and exhaustive examination when the disease is first noticed, so as to determine whether or not it is simple catarrh or infectious catarrh, in order that the treatment may be gauged accordingly.

Symptoms.—Birds more or less dull; disinclination to move; poor appetite. Sometimes the mucous membrane thickens, causing obstruction to breathing; there is a thin, watery discharge, which later becomes thick; eyes are often watery; eyelids swollen and sometimes held together. In the more severe and complicated cases of catarrh the feathers often stand erect; nostrils are completely obstructed and breathing carried on entirely through the mouth, accompanied by a whistling or snoring sound. The bird has no appetite and a thin liquid runs from the mouth. Finally it becomes exhausted and dies.

Causes.—Causes are undue exposure, dampness, drafts of cold air.

Treatment.—Remove the cause and give good, stimulating feed. Each fowl should receive one-half teaspoonful of Davis Poultry Food a day. It is better, perhaps, to give it one-sixth of a teaspoonful at a time three times a day. If Davis Poultry Food is not at hand, use the following:

Gentian root	4 drams.
Ginger	4 drams.
Sulphate of iron	2 drams.
Hyposulphite of sodium	1 dram.
Salicylate of sodium	1 dram.

The above substances should be thoroughly pulverized and mixed, and 3 to 5 grains a day given each fowl.

Roup or Contagious Catarrh.

This disease is probably caused by a germ. **Symptoms.**—The early symptoms of this disease cannot be distinguished from those of simple catarrh. As the disease advances the inflammation extends from the mucous membrane along the internal surface of the air passages, and ulceration is liable to occur. The secretion instead of remaining fluid will become thick, yellowish and cheesy. It forms around the eyes and oftentimes forces the eyeballs out of the sockets. It also at times blockades the nasal passages, presses down the palate and obstructs breathing entirely. At times it may also prevent swallowing.

Treatment.—Thorough disinfection of the surroundings. Exclude contagion by every means that can be devised. Isolate all affected birds. The wounds and ulcers and eyes may be treated with a solution of boric acid, 15 grains to the ounce of water. Some people report excellent results from the use of kerosene mixed in equal parts with olive oil. Dr. Fillmore's Roup Cure will cure a majority of cases if taken in time. Davis Poultry Food as a tonic and stimulator should be given in the proportion of one teaspoonful to each fowl once a day. It is important to dispose of the carcasses of all dead birds promptly by burning them.

Bronchitis. This is an inflammation of the mucous membrane of the trachea and bronchial tubes, due to exposure and dampness, cold drafts of air, etc.

Symptoms.—Dullness; loss of appetite; quick breathing; cough. Whistling sounds may be heard from the throat because of the air being drawn over the dry and thickened membrane. The birds frequently open their beaks in order to get fresh air.

Treatment.—Give soft and cooling feed, such as stale bread moistened with milk. Let them inhale steam or vapor from boiling water in which one tablespoonful of Phenalin has been mixed with each quart of water. If Phenalin is not at hand, carbolic acid may be used, although not so good. Give each fowl one-half teaspoonful of Davis Poultry Food once a day. If this is not at hand get black antimony and give each fowl 2 grains a day. Flaxseed steeped in hot water often gives great relief. Should the attack be severe it can often be controlled in the early stages by giving 10 drops of turpentine in a teaspoonful of castor oil, and the dose may be repeated in five or six hours, although not oftener. Care should be taken in administering medicines in all diseases of the bronchial tubes or air passages. They should always be soft and free from roughness so as not to excite the inflammation.

The Gapes. This is a parasitic disease caused by the presence in the air passages of a worm called the *syngamus trachealis*. The prominent symptom is that of frequent gaping, from which the disease has been named gapes.

Description of the Worm.—It is a small, round worm, red in color, that attaches itself by its mouth to the mucous membrane of the bird's trachea or windpipe. The female worm is usually $\frac{1}{2}$ inch in length; the male less than $\frac{1}{4}$ inch. They suck the blood from the bird, and in doing this set up considerable irritation and inflammation. They rapidly exhaust the strength and obstruct the windpipe, thus causing death by exhaustion or asphyxiation. Young birds become affected with this parasite either by eating the adult worms, containing eggs, which are coughed up by affected birds, or by taking the embryo into their system with feed or drink. It will therefore be seen that it is very important to isolate all affected birds.

Symptoms.—This disease is seen most frequently in young birds. The bird will be observed to lose its appetite and be less lively than usual. The head will be frequently extended with open beak—in other words, gapes. If watched they will be seen to gape every minute or so. They will soon begin to cough and emit a whistling sound. A whitish liquid may flow from the mouth and nostrils at times. If badly affected the bird will become weak. The feathers roughen, the wings droop, and the neck is shortened or drawn up, except when extended for gaping. The bird will shake its head convulsively, as if trying to get rid of the foreign bodies in its throat.

Treatment.—Separate the sick birds from the well at once, and clean up the coops and yards and drinking troughs thoroughly with a 2 per cent solution of Phenalin or 5 per cent solution of carbolic acid. Burn the bodies of the birds that have died. To remove the worms from the chick's throat either a feather, or hair from the tail of a horse may be used. If a feather is used, strip it to the web, except near the tip, and moisten the tip with kerosene or turpentine. If a horse hair is used, fold it, and twist the two ends so as to leave a small loop at the extremity. Force the chicken's mouth open with the fingers of the left hand, and when the glottis opens for breathing thrust the hair or feather into the windpipe, then turn and twist it several times and withdraw. One or more worms may then be adhering to it. Care should be taken in removing these worms, as the windpipe is very tender and sensitive, and may be liable to injury from a broken or rough feather. For internal treatment the following has been advised: Make a mixture of hard boiled eggs, crumbs of stale bread and boiled beef's heart; chop these ingredients finely and then pound them into a thorough paste. To this paste add garlic in proportion of one bulb to each ten chickens, and feed the birds. Asafetida, 8 grains to each fowl a day, given in a powder combined with an equal quantity of yellow gentian, mixed into a paste and given to the fowl, is good treatment. Davis Poultry Food, mixed into a paste and rolled into pills, each pill about the size of a pea, and given every hour or two, has proved satisfactory.

Congestion of the Lungs. **Causes.**—The usual causes are exposure to cold, which leads to contraction of the external blood vessels, and this forces a large amount of blood into the internal organs. It is most often seen in fowls that are molting, which have been exposed to cold drafts or rain when the skin is partly denuded. It is also very

common among young chickens and turkeys allowed to run in the rains of early spring. Incubator chicks allowed to get chilly are also frequent victims.

Symptoms.—The bird breathes rapidly and with difficulty. It is indisposed to move, sleepy, and does not notice things around it. A thick mixture, tinged with blood, escapes from the mouth. The comb is dark red or bluish from the lack of oxygen in the blood. The symptoms appear suddenly. The bird may live but a few minutes and sometimes a few hours.

Treatment.—The treatment consists almost entirely of preventive measures, because when the disease once occurs the development is so rapid that there is no chance to treat it. Young birds and fowls that are molting should be guarded against exposure. Birds in confinement should have a varied ration, with Davis Poultry Food, and plenty of exercise. When birds are dying from any cause a careful examination of the carcasses should be made. If the lungs are found very dark in color and distended with blood, particularly if blood is found in the bronchial tubes, this indicates the nature of the disease and should lead to the adoption of preventive measures at once.

Causes.—Chills; impaired activity of the general circulation; inhalation of irritating vapors; in some cases bacteria and germs.

Pneumonia.

Symptoms.—The symptoms are very similar to those in pulmonary congestion, and breathing is very rapid, difficult and painful. There may be a discharge from the mouth or nostrils of a yellowish or grayish fluid, tinged with blood. The plumage of the bird will stand erect, with wings drooped and head drawn in. There is a loss of appetite, great thirst and constipation.

Treatment.—The disease is very rapid and therefore very unsatisfactory to treat. The fowl should first of all be taken into a warm room and covered with a piece of blanket if the weather is at all cold. The head should be left uncovered, however, so that the bird can get all the fresh air necessary. As a drink give linseed tea, made by pouring a pound of boiling water on an ounce of flaxseed and keeping the mixture hot, but not boiling, for two or three hours; then remove the seeds by straining, and a sort of mucilage will result which is very valuable in the treatment. It also serves as a vehicle to carry the medicine. If the patient appears to be failing rapidly, becomes sleepy, develops a dark bluish color of the comb, put 15 drops of tincture of digitalis in an ounce of water and administer 10 drops of the mixture every two hours. Care should be taken in the administration of the medicine in order not to get it into the air passages. As the bird begins to improve a grain of quinine with 10 drops of cod liver oil twice a day will hasten recovery. The feed, during the sickness, should consist of a soft mash to which Davis Poultry Food has been added.

This is a catarrhal inflammation of the mouth.

Pip.

Symptoms.—A dryness of the membranes of the mouth, particularly the tongue; a hard deposit accumulates along the edge and end of the surface of the tongue, sometimes firmly attaching this organ to the rest of the mouth. The dry membrane may partly separate and form a shell, which remains attached to the free extremity of the tongue, causing more or less painful contraction and interfering with the movements of the tongue.

Causes.—This disease may arise from any form of local irritation or injury which is sufficiently serious to set up inflammatory action. In most cases it is probably caused by micro-organisms.

Treatment.—Moisten the tongue with a few drops of equal parts of glycerine and water, to which has been added 20 grains of chlorate of potash to each ounce. If properly treated this disease will remain localized and will not cause any great danger. Exaggerated ideas of its dangerous nature will undoubtedly arise from the fact that it is often associated with more serious diseases.

Thrush.

This is a disease affecting the mouth, and characterized by a whitish or yellowish deposit on various parts of the membrane lining that cavity. It is a very rare disease and but a few cases have been recorded. There are no characteristic symptoms, except the whitish patches on the inflamed membrane. The head may be swollen and there is a rapid loss in weight, usually preceded by convulsions.

Treatment.—The system of the bird should be strengthened by good feed and tonics. Davis Poultry Food, giving $\frac{1}{2}$ teaspoonful a day to a bird, is quite effective. The parts affected should be treated with antiseptics, such as a 1 per cent solution of Phenalin, or, better still, a 10 per cent solution of borate of soda.

Diphtheria.

Diphtheria is recognized by whitish, grayish or yellowish patches of false membrane upon the mucous membrane of the mouth. It is a serious contagious disease, and is oftentimes confounded with roup. Diphtheria affects not only the mucous membrane of the mouth, but the nasal passages, the eyes, the throat, and may extend into the windpipe or the bronchial tubes.

It is characterized by an exudate of a grayish or yellowish nature, called the false membrane, which forms upon the surface of the parts mentioned. This becomes attached to the living tissue, so that, when it is forcibly removed, a raw, bleeding surface may be left. The bird will lie with the back arched, head or neck drawn down into the body, feathers roughened, breathing rapidly; the swallowing is very difficult; there is more or less shaking of the head and sneezing; the mouth, if examined at this time, will be found very pale, with small gray spots shaded with black, slightly projecting above the surface. In a day or so the temperature increases, the appetite disappears, and diarrhea sets in. From the open beak there comes a thick, stringy, grayish mixture; the eyes are dilated and projecting; walking is irregular and difficult, and the patches on the tongue increase in size. From the third to fifth day the whole interior of the mouth may be covered with false membrane, completely obstructing the passage. The swallowing is either difficult or impossible.

Cause.—This disease is undoubtedly caused by a bacillus and is contagious. Various experiments and investigations have demonstrated that the disease of diphtheria in children has been communicated to fowls.

Treatment.—Prompt measures should be taken to prevent the introduction of contagion among normal fowls, and the sick ones should be isolated at once. All dead birds should be burned if possible. Thorough disinfection with Phenalin of the houses, yards, feed troughs, and drinking fountains. Sick birds should be placed in a warm, ventilated, dry place, where they will not be exposed to drafts. Apply a 2 per cent solution of Phenalin to the spots on the mouth three or four times a day, and if possible inject a small quantity of this solution into the mouth and throat. An excellent remedy is made by dissolving 35 grains of potassium chlorate and 2 grains of salicylic acid in 1 ounce of water, and adding thereto 1 ounce of glycerine.

This liquid should be applied to the diphtheritic spots two or three times a day, and may also be given internally, in adults, one teaspoonful to each fowl.

Fumigation with oil of turpentine, by evaporating it in the room so that the birds will be forced to breathe the vapor, will be found beneficial. Stimulating and tonic remedies have been very successful and especially valuable in chronic cases. Davis Poultry Food has been especially effective and should be given in proportion of one-half teaspoonful to a fowl each day. It is, perhaps, a good idea to mix this with a small quantity of syrup, so that it can be rolled into pills. Fowls that have been affected and are recovered should not be returned to the flock for thirty days, as they may still be able to communicate the contagion.

Choking or Obstruction of the Pharynx.

Birds sometimes attempt to swallow a particle of feed or something so large and irregular that it becomes lodged in the pharynx. This condition may be recognized by the efforts of the birds to rid themselves of the object, and by passing the fingers over the throat a hard swelling can be distinguished. Prompt relief must be afforded or death will result from the affliction. The object can easily be removed by carefully pressing on the side of the throat in such a manner as to force the foreign body into the mouth. If it is difficult to move it in this way, a teaspoonful of olive oil poured into the back of the mouth may assist in dislodging it. A small pair of forceps may in some cases be of service. Careful manipulation by the fingers, however, can usually be relied upon to accomplish the removal.

Inflammation of the Crop.

This is an inflammation of the mucous membrane lining the interior of the crop, resulting in a disturbance of the functions of this organ.

Causes.—This disease may be caused by irregular feeding, or by too much feed being taken at one time. Again, the fowl may eat feathers or other indigestible substances, which may irritate the mucous coat of the throat. Putrid feed of any kind is irritating. It may also result from the presence of worms.

Symptoms.—The most prominent symptom is distention of the crop, and on examination of the swelling it is found to be soft, due to an accumulation of liquid or gases mixed with more or less feed. The birds are dull and disinclined to move. Loss of appetite, belching of gases, and more or less weakness are characteristic symptoms. Pressure on the crop causes the expulsion through the mouth of liquid and gas, having an offensive odor.

Treatment.—A clean, dry pen should be provided and the next step should be to empty the crop of the irritating and decomposing contents by careful pressure and manipulation while the bird is held with its head downward. When the crop appears nearly empty give 2 grains of subnitrate of bismuth and $\frac{1}{2}$ grain of bicarbonate of soda in 1 teaspoonful of water. This will remove the irritation and correct the acidity. The bird should now be kept without feed for from eighteen to twenty hours and then fed sparingly upon soft mashes that are easily digested. One-half grain of quinine morning or night for two or three days may prove beneficial. After the fourth day roll Davis Poultry Food in pills and give it. If the treatment is commenced in time this disease can easily be cured.

Gastro Intestinal Catarrh.

This is a disease of the entire intestinal tract, consisting of an inflammation of the membranes lining the various organs.

Causes.—It may result from overloading the stomach; from too stimulating rations; from too much pepper; from eating tainted, moldy or putrid feed; from drinking water that has been contaminated by filth; from exposure to draft, cold rains or damp coops.

Symptoms.—Loss of appetite and roughness of the plumage; disinclination to move; folds of the crop are partially paralyzed, causing it to empty itself slowly, and there is therefore a distention of it; slight diarrhea at first, with a passage of a soft, yellowish or greenish excrement. This gradually gives way to severe diarrhea. There is increased thirst, elevation of temperature and usually hemorrhages from the intestines in severe cases.

Treatment.—It is most important that the cause be removed. See that the birds are comfortable; not exposed to drafts or dampness; that they have absolutely pure drinking water and are fed nothing but mush or cooked feeds, with a little daily allowance of Davis Meat Meal and Davis Poultry Food. Place a handful of oatmeal in the drinking water, or, perhaps, better still, give them milk to drink. A teaspoonful of olive oil as a laxative to carry off the irritating substances in the intestines will prove beneficial. Follow this with 2 grains of bicarbonate of soda and 2 grains of subnitrate of bismuth in a little water three times a day. Should the diarrhea become serious, with symptoms of pain, omit the bicarbonate of soda and give $\frac{1}{8}$ of a grain of powdered opium and 2 grains of subnitrate of bismuth every four hours. If the diarrhea persists after the fever has disappeared it may be checked with laudanum, 5 to 10 drops.

Causes.—Caused by dry, stringent feed or other deleterious matter.

Constipation. May result from irritation by mechanical means. May also be due to an unnatural dryness of the intestines.

Symptoms.—Birds which are afflicted with serious constipation become dull, lose their appetite, stand with an arched head, feathers on end, walk with difficulty, are uneasy, and make frequent attempts to expel excrement.

Treatment.—When the excrement accumulates upon the feathers it should be soaked in warm water until softened and then by clipping some of the feathers it is easily removed. If the cloaca is filled with a hardened mass it should be softened with warm water or olive oil, and carefully manipulated until it can be pressed out or otherwise removed. Oil can be injected around such a mass with an ordinary syringe, or, in the absence of a syringe, with an ordinary oil can. After the oil has been applied it will be well to wait for an hour or two until it has had an opportunity to soften the mass.

In the case of serious constipation, when the obstructions are farther forward, the most successful treatment is 20 to 30 grains of Epsom salts dissolved in a tablespoonful of water. Castor oil, one or two teaspoonfuls, may also be given with good results. The constipation should be corrected so far as possible by regulating the ration and by adding Davis Poultry Food, in proportion of one teaspoonful for each fowl. Give soft mashes, green feed and bran until the fowl appears in a normal condition.

Toxic-Gastro-Enteritis.

This is an acute inflammation of the intestinal tract, quite commonly seen in poultry as the result of the fowl eating irritating matter.

The symptoms are a general inflammation of the mouth, trembling convulsions, diarrhea and drowsiness. The fowl usually seeks quiet and unfrequented places, and is found with her head drawn close to the body, generally in a sleepy or comatose condition. Unfortunately, however, the poisonous juices are not discovered until too late for successful treatment, which should be about the same as for simple gastro-enteritis, which is described under that name. In addition to this use mucilaginous drinks, such as infusions of flaxseed, together with strong stimulants, such as coffee or brandy.

Blackhead.

This is an infectious disease of turkeys and is rather serious on account of the fact that the infection usually becomes quite advanced before any diagnostic symptoms are exhibited. The affected birds will show a slight loss of appetite, which is followed by weakness and emaciation. The diarrhea is the most marked and constant symptom, but appears past the middle course of the disease. A peculiar discoloration of the head appears at the height of the disease, and has led to the popular name of blackhead, although the discoloration of the head is not constant. Young turkeys are quite susceptible. It has been recognized most often in birds about three weeks of age, but old birds are not exempt by any means.

Causes.—The disease is caused by one of the protozoa named the *Amoeba meleagridis*. This parasite gains entrance to the digestive organs with the feed or drink, attacking the mucous membrane of the caeca, causing the development of inflammation. It is assumed that the microparasites are carried by the blood into the liver, where they multiply and spread in all directions. Affected birds usually die in from two to six weeks, although in some cases a bird may live all summer. During the course of the affection the parasitic protozoa multiply and are mixed with the contents of the intestines. They are discharged with the excrements, and in this way contagion is spread.

Treatment.—It is evident that the treatment must be principally hygienic and preventive measures. Great care should be taken in separating all infected birds. All runs, roosting places, feed grounds, drinking fountains, feed troughs, in fact, every place where the birds have access, should be thoroughly disinfected with a 2 per cent solution of Phenalin. And it would be wise to kill or dispose of all the turkeys on the farm, since, as before stated, the disease may gain entrance to the system and lie dormant all summer before causing death and in this way the affected birds may be propagating the disease. Medical treatment of the diseased birds has been more or less a failure. The following may be tried however: Sulphur, 5 to 10 grains; sulphate of iron, 1 grain. Combine this and give them one dose of it. Or try sulphur, 10 grains; sulphate of iron, 1 grain; quinine, 1 grain. Combine and give in one dose. These doses are for birds weighing from 3 to 5 pounds.

Worms.

There are a large number of animal parasites peculiar to the digestive system of fowls. Some cause serious disturbance or serious disease, while others are apparently harmless.

Parasites of the Stomach.—There are a number of round worms infecting the stomach of fowls, the most dangerous of them being the *Trichosoma contortum*, which packs itself in the cervical dilation of the esophagus, obstructing the passage. It also bores into the walls and through the walls of the esophagus, thus weakening the structure and making it impossible for the muscular contraction and action to force the food on, which collects in this dilation and impaction of the birds.

Symptoms.—This disease is seen most frequently in young Pekin Ducks. The symptoms are unrest, emaciation and weakness. Inside of a week or ten days a swelling appears in the lower part of the neck, which rapidly increases and leads to death in one or two days.

Treatment.—The treatment is similar to that recommended for gapes. Turpentine is one of the best remedies. It may be mixed with twice its quantity of olive oil, and a teaspoonful given of both.

Intestinal Worms.

Symptoms indicating the existence of worms are not very characteristic. As a rule, however, the birds become weak, dull and emaciated. The feathers lose their brilliancy and become roughened. There is a tendency to diarrhea, and the bird will seek quiet and rest apart from the flock.

In the case of a chicken dying from an unknown cause, it should always be opened and examined, and if worms are found in the intestines it will serve to show what in all probability is the trouble with the rest of the flock.

Treatment.—Preventive measures, among which may be mentioned a frequent disinfection of yards and houses, together with proper feeding, are in this case, as in all others, the best treatment. It is most important that the fowls be moved upon fresh ground at least once a year, and the old ground plowed under. Davis Poultry Food, fed regularly, makes it impossible for parasites to develop in the intestines. When the parasites are once established in your flock all affected birds should be isolated, their droppings either burned or covered with lime, and other hygienic measures added. Medical treatment can only be partially successful. Pomegranate root, 1 teaspoonful to each fifty birds, is very effective. This should be varied by a dose of castor oil, 2 teaspoonfuls to a bird. Powdered Areca nuts may be given in doses of from 30 to 45 grains, mixed with butter and made into pills; or male fern, powdered, in 30-grain doses, are both very effective; but Davis Worm Powders are better than either of the above. Oil of turpentine is also an excellent remedy. More than 1 teaspoonful should not be given, however, and it should be diluted in equal amounts of olive oil.

DISEASES OF THE PERITONEUM, LIVER AND SPLEEN.

Peritonitis.

An inflammation of the peritoneum, a delicate serous membrane, lining the abdominal cavity and covering the surface of the organs located in this cavity. It may occur from a severe inflammation of the intestine, liver or kidneys, or from perforation of the intestine and the escape of a portion of the contents into the abdominal cavity. Rupture of the oviduct, injuries or bruises of the abdominal wall, irritation due to parasites in the cavity, are other causes.

Symptoms.—Loss of appetite, fever, restlessness and painful efforts to void the excrement. Abdominal walls hot and painful if pressed upon. Birds rapidly lose strength until no longer able to stand. There are convulsive movements and death follows. The disease is rapid in development.

Treatment.—Peritonitis is an exceedingly difficult disease to treat. The best way is to insure your birds against contracting it by always having a supply of Davis Poultry Food on hand, and by feeding it with the regular feed ration, keep your flock in healthy condition. If, however, the disease has been contracted, the affected birds should be kept quiet and protected from currents of air. Opium in doses of 1 grain every four hours is recommended to quiet the pain and reduce the movements of the intestine; or mix 3 or 4 drops of tincture of aconite in half a glass of water and give a teaspoonful three or four times a day. Injections of tepid water are recommended to counteract constipation. Flannels, dipped in hot water and squeezed partly dry, applied to the abdominal wall, and renewed as often as possible to keep up the moist heat, are excellent. If, however, the disease is due to rupture of the oviduct or perforation of the intestine, treatment is useless and the bird should be killed.

Diseases of the Liver.

This is one of the largest and most important organs in the fowl's body. It prepares the bile, one of the principal digestive fluids, and assists in a number of the most necessary chemical changes occurring in the blood. It contains numerous blood vessels through which a large quantity of blood passes, and is particularly subjected to the attacks of various parasites, finding their way to the liver through the blood channels, and there settling down to their destructive, disease producing work.

Congestion of the Liver.

Congestion of the liver is often found in fowls, due to lack of exercise, overfeeding, or tainted or moldy feed taken into the digestive organs. Infectious diseases, obstruction to the blood circulation, etc., are other causes. Birds in plethoric condition or very fat are especially liable.

Symptoms.—The symptoms are obscure and difficult to analyze. A diagnosis during the life of the affected bird is not often possible. The post mortem examination shows a vastly enlarged liver engorged with blood, tender and easily crushed or torn.

Treatment.—If the disease is recognized in time for treatment; give sulphate of magnesium or sulphate of sodium in a purgative dose (20 grains to a dram), and follow with sulphate of magnesium, 10 grains, bicarbonate of sodium, 2 grains, repeated daily for a week. One-quarter teaspoonful of Davis Poultry Food rolled into pills and given as one dose, will be found very effective in combating the disease. The trouble should be prevented by proper feeding, regular exercise, and protection from parasites and infectious diseases. Davis Poultry Food, given with the regular ration every day according to directions, will practically insure the fowls against the disease.

Due to same causes as congestion of the liver. It is a different and more advanced stage of the same disease.

Inflammation of the Liver, Hepatitis.

Symptoms.—Loss of appetite, sluggishness, tenderness over the abdomen, and sometimes a yellowish color or jaundice of the skin.

Treatment.—Only treatment for birds that are valuable for breeding or exhibition purposes is advised. Otherwise, when so affected, it is best to kill them. On treating them, begin with $\frac{1}{2}$ to 1 grain of calomel, followed with 20 grains of Epsom salts and 2 grains of bicarbonate of soda after twelve hours. To each dose add Davis Poultry Food in equal parts. If the diarrhea is excessive and weakens the bird, treat as recommended for that disease. When marked improvement is shown, give green feed, Davis Poultry Food as a tonic, and Davis Meat Scraps, and permit the bird plenty of exercise in the open air.

Jaundice, Biliary Repletion of the Liver.

Congestion of the liver may lead to an exaggeration of the functions of this organ characterized by the accumulation of a large quantity of bile in the gall bladder, penetrating the adjoining organs by imbibition, and coloring them for a considerable distance. The bile is thick, dry and hard, like a piece of black soap.

Unfortunately the nature of the disease is only occasionally suspected before death. With birds having combs and wattles, or those which have the borders of the eyes or cheeks free from feathers, a close observer may detect the yellowish or mahogany color of these parts indicating the disease.

Treatment.—When the disease is discovered purge with $\frac{1}{2}$ to 1 grain of aloes, and change the ration completely, giving as great a variety of feeds as convenient. Davis Poultry Food mixed with the ordinary ration in proportion of $\frac{1}{2}$ teaspoonful a day will greatly facilitate the recovery.

Atrophy or Wasting of the Liver.

This disease, technically known as atrophy, is generally associated with hardening and sometimes with a marked yellow coloration.

Causes.—Some authorities consider it due to compression, and it may result from this cause when there is a great accumulation of fat in the abdominal cavity. In most cases it undoubtedly results from chronic inflammation. Other authorities regard it as caused almost entirely by infections and intoxications.

Symptoms.—The surface of the liver is often more or less granular, the small centers of glandular tissue being shrunken, undergoing degeneration and surrounded by thickened connective tissue. This process is accompanied by the obliteration of old vessels and the formation of new ones, there is even a formation of new bile ducts, which, however, is more or less incomplete, as most of the new ducts fail to perform their functions. The symptoms are obscure and the disease hard to recognize while the bird is alive. Dullness, drowsiness, stupor, and possibly convulsions are features accompanying the malady.

Treatment.—The treatment must be largely preventive on account of the extreme difficulty of diagnosing the disease in time. Davis Poultry Food, in the proportion of 1 tablespoonful to each twenty birds, added to a properly balanced daily ration in which excess of starch and fat is avoided, will prevent the trouble. Give plenty of exercise, with green feed, avoid grain or meal that is musty or moldy,

as well as decomposing feed of all kinds. The early stages of atrophy may be treated with calomel, saline purgatives and alkaline salts, as recommended for hepatitis.

A rather common disease of birds, largely attributed to lack of variety in feed, close confinement and insufficient exercise.

Fatty Degeneration of the Liver.

Causes.—Examination after death discloses the liver in a shrunken, hardened and marbled condition, or spotted with areas of grayish or yellowish tissue. A microscopical examination shows the cells to contain droplets of fat and the liver tissue degenerated and largely replaced by yellow and fat globules.

Treatment.—Preventive measures. Davis Poultry Food, in proportion of 1 tablespoonful to each twenty birds, added to the regular ration, is the only effective measure to be taken, as the disease is not recognized during life. If a number of cases occur in the same flock give a greater variety of feed and a run of grass. Bicarbonate of soda may also be given in the drinking water to the amount of 1 or 2 grains a day for each bird.

Fatty Liver.

Authors who have examined into the subject contend that the fatty livers which are so skillfully developed by certain feeders of ducks and geese, and which are considered to be a great table delicacy, ought not to be confounded with livers which have undergone fatty degeneration. The latter is a disease, while the former is simply a physiological condition. In fatty degeneration the liver is shrunken, fat forms with the cells and destruction of the cells occurs. In fatty livers, on the other hand, the fat is deposited between the microscopic elements of the liver, and this organ is thereby enlarged and made more succulent and delicate. In this case no breaking down of cells takes place. There is no disease if the fattening is properly done.

Tuberculosis of the Liver, Spleen, and Peritoneum.

Whitish or yellowish white nodules and aggregations of nodules, varying in size from a mere point to an inch or more in diameter, characterize this disease. These develop either in the peritoneum or in the tissue of the liver and spleen. The affliction is of the same nature as tuberculosis. It is incurable and therefore no treatment is recommended apart from preventive measures, sanitary and otherwise, as indicated in the chapter upon this subject.

DISEASES OF THE ORGANS OF URINATION AND REPRODUCTION.

A Short Description of the Urinary Organs.

Two kidneys and two ureters form the urinary apparatus in fowls. The bladder is absent, the cloaca forming a depository for both feces and urine. The kidneys in fowls are divided into three distinct lobes, each lobe connecting with the ureter. The texture of the kidney is much more frail than in the mammalia and yields readily to the pressure of a finger. The uriniferous tubes do not empty into a cavity or pelvis in the interior of the kidney as with mammals, but unite to form a ureter upon the surface of the gland. Beyond the kidneys the ureters pass behind the cloaca, penetrate its walls, and finally end in valvular eminences in the lower part of the cloaca. The urine secreted is very thick, with the color and consistency of cream. It is made up almost entirely of uric acid. In the cloaca it dries to a chalky paste, and is expelled therefrom with the feces. As all poultry keepers know, the excrement of birds is composed of two distinct portions, one white and the other differing in color from time to time. The first is the secretion of the kidneys and the last is the residue of the alimentary matter which has passed through the stomach.

Inflammation of the Kidneys.

There is an evident suffering in the vicinity of the kidneys. The bird is prone to lie continually upon its abdomen, rising with difficulty in order to eat. An examination made after death will reveal an enormous enlargement of the kidneys and, upon cutting across these organs, numerous black points, each representing a minute intestinal hemorrhage, will divulge themselves. Other symptoms are cessation of growth in the young pullet, loss of appetite, emaciation, improperly developed feathers and roughened plumage. Microscopical examination has revealed the existence of minute organisms in the kidneys, and some authorities have ascribed this to toxic fungi contained in the feed. Preventive treatment, consisting of Davis Poultry Food added to a varied and nourishing ration, with plenty of fresh air and exercise, is the only effective means of combating this disease.

Obstruction of Cloaca by Urinary Concretions.

Many instances are reported of partial or complete obstruction of the cloaca by drying or hardening of urinary accumulations. Improper rations are usually the cause of these concretions in the cloaca. Nitrogenous matter is fed too heavily. Davis Poultry Food will tend to prevent and correct the trouble if added to the daily ration. If the disease is advanced the contents of the cloaca should be carefully softened with warm water and removed. A small quantity of olive oil injected daily for six days will guard against further accumulations and give any local irritation that may have arisen time to pass away. No other treatment than this and Davis Poultry Food is required.

The Making of an Egg.

The female organs of reproduction in fowls, which are responsible for the making of the egg, consist of a single ovary and a single oviduct. During the first part of the life of the chick the two ovaries are of the same size, but soon developmental forces apparently concentrate in the left ovary. The right remains undeveloped and finally disappears. The remaining ovary develops to a remarkable degree. The external appearance is that of a granular or nodular body attached to the spinal column by a fold of peritoneum. The nodules are irregular in size, some small and whitish, others large and of a yellowish color. The ovum is enlarged, due to an accumulation of food yolk, called the yellow, this causing distension of the ovarian capsule that encloses the ovum. This capsule is also called the calyx. As the ovum grows bigger its capsule becomes more and more separated from the remainder of the ovary, until it is seen to be attached only by a narrow base or pedicle. The calyx consists of two membranes united by connective tissue and blood vessels, converging toward a white transverse line or band, crossing the most prominent part of the calyx. This band is called the stigma and begins to appear when the ova are well developed.

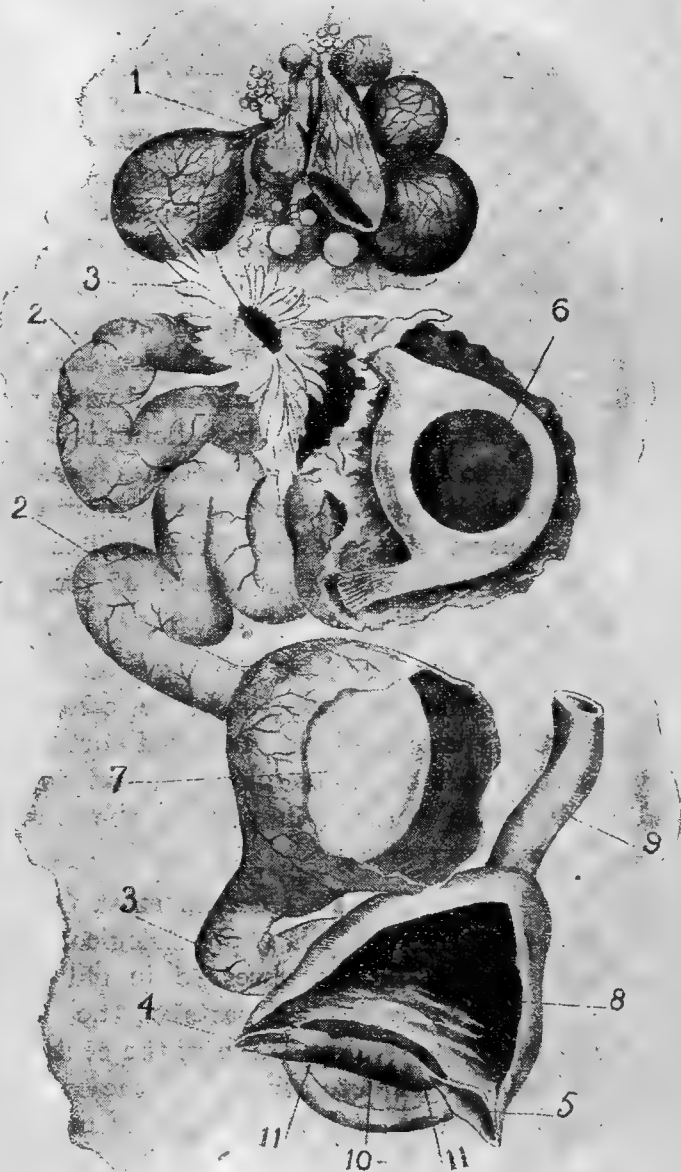


Figure 33.

Reproductive organs of the hen: 1, ovary; 2, oviduct; 3, infundibular portion of oviduct; 4, depression corresponding to right oviduct; 5, opening of left oviduct; 6, oviduct laid open to show egg surrounded with first layers of albumen; 7, uterus opened to show egg with shell forming upon it; 8, cloaca; 9, rectum; 10, upper portion of anus; 11, openings of ureters.

The line becomes broader and the membranes thinner as the ovum increases in size. When the right time arrives the walls of the calyx give way along this line and the egg slips out of its capsule, passing into the infundibular opening of the oviduct. The egg when it enters the oviduct consists of a vitellus yolk enclosed in a very thin vitelline membrane. It is in the upper portion of the oviduct that impregnation or fertilization takes place. After entering the oviduct the ovum is propelled with a rotary motion, by the peristaltic contractions of that tube, toward the cloaca. Contact with the ovum stimulates the oviduct into secreting first a dense layer of albumen, which is deposited upon the vitelline membrane and continued in fine threads from pole to pole. The threads or filaments thus produced are the chalazae and the dense layer of albumen with which they are connected is the membrana chalazifera. As the egg rotates in the oviduct the chalazae become twisted in opposite directions, and the one next to the small end of the egg finally adheres more or less to the membrane lining the shell at that point. Advancing farther back in the oviduct two other layers of albumen are secreted and deposited upon the egg, each thinner and more watery than the preceding one. Reaching the narrowest part of the tube two still denser layers of albumen are excreted, making the membrana putaminis. Thus enclosed and having acquired its ovate form with the small end toward the cloaca, the egg enters the uterine or shell forming dilatation. The inner surface of the oviduct here secretes and deposits upon the membrana putaminis a thick white fluid which condenses, becomes calcareous and finally forms the shell. It is said that approximately five hours is required in the common fowl for the egg to pass from the infundibulum to the uterus. Sometimes it may be arrested there for from twelve to twenty hours. The color of the shell depends upon the pigmental matter secreted by the villous membrane of the uterus. If pores appear on the outside of the shell they are caused by impressions of the formative membrane. The shell is largely made of carbonate of lime to which is added a little carbonate of magnesia and phosphate of lime and magnesia.

The oviduct, in which the egg goes through the process of formation, is simply a whitish tube, slightly larger than the large intestine, containing many branching blood vessels upon its surface. It starts close to the ovary by an enlarged portion named the infundibulum, bends upon itself several times, forming three principal convolutions, and finally reaches the cloaca, into which it opens. The ovary and oviduct are reduced in size in the nonbreeding season, when the parts are inactive, almost disappearing from view.

Atrophy of the Ovary.

This occurs most frequently during the nonbreeding season, when, however, it is a physiological atrophy and not a disease. The same phenomenon may be observed in old hens, sometimes accompanied by remarkable changes in other parts of the body. The spurs are enlarged, the feathers grow longer and more brilliant, rivaling those of the cock. The habit and voice of the male is also largely assumed by such birds. Complete atrophy of the ovaries is sometimes congenital; in other words, these organs fail to develop at all. Cases are also recorded in which rudimentary organs of both male and female are present in the same individual. Where this condition exists the bird also in voice, plumage, spurs, habits, etc., resembles the capon. They are good for nothing but the table and should be fattened and killed.

Gangrene of the Ovary.

A common disease with all kinds of poultry. A post mortem examination of the ovary will show the ova in different stages of development. However, instead of being yellowish pink in color, with well defined blood vessels, they are black or brown, easily crushed and the contents broken down into a putrid liquid. As it may occur in birds which are not fat, and as it evidently is accompanied by bacteria, it probably is an infectious disease. Death is caused partly by peritonitis and partly by the absorption of the products of decomposition.

Inflammation of the Oviduct.

This organ, being a highly vascular tube, with great functional activity during the laying season and consequently subject to injuries of various kinds, is often affected with inflammation.

Causes.—Irritation due to too frequent laying; too large eggs; too stimulating feed; breaking of an egg within the tube; obstruction of the cloaca.

Symptoms.—Bird shows desire to lay without being able to produce eggs; may lay eggs containing more or less blood, without shell; also small, misshapen eggs, containing albumen but no yolk; or the yolk may be dropped without any albumen or shell. As inflammation increases there is high temperature, straining, an effort to rub the abdomen upon the ground. Bird becomes dull, indisposed to move, comb is pale, plumage rough, and temperature falls to normal or below in the last stages.

Treatment.—If treatment is to be successful early attention is imperative. Give green, cooling feed; avoid meat or irritating ingredients. Give Davis Poultry Food with each day's rations. Keep bird quiet and administer Epsom salts 20 grains, bicarbonate of soda 2 grains. Follow this with $\frac{1}{2}$ drop of tincture of aconite root three times a day.

Prolapsus of the Oviduct.

This is a common disease, most often observed in old hens that have been great layers. Overfeeding, too stimulating feed, constipation, and straining to expel large eggs are direct causes. This disease may also occur as a result of inflammation of the tube or from any cause preventing the passage of the eggs.

Symptoms.—Efforts to expel eggs may cause prolapsus; it is observed as hen leaves the nest; usually only partial at first, gradually increasing. In the latter case a tumor may be noticed within the mouth of the cloaca. In the course of a short time the eversion continues and a large dark red or violet colored mass protrudes from the vent.

Treatment.—Catch bird at once and ascertain if an egg is arrested in the passage. If swelling is soft, with no signs of an egg, apply carbolized oil or lard, returning the part by gentle pressure. Then treat bird as for inflammation of the oviduct, giving additional treatment of 3 to 5 drops fluid extract of ergot, to cause contraction of the oviduct and keep it in position. If an egg is found within the swelling, treat as recommended for obstruction of the oviduct.

Difficult Laying, Egg Bound, Obstruction of the Oviduct.

Causes.—Irritation of the lower part of the oviduct, arresting the secretion of mucus and causing the mucous membrane to be dry and lacking in its normal lubrication. Another cause is too large eggs or birds being too fat; it may be aggravated by constipation.

Symptoms.—In advanced cases bird may be unable to expel the egg; the egg is arrested in the passage, where it sets up inflammation, leading to straining and sometimes prolapsus of the oviduct. There is a frequent inclination to go to the nest, making efforts to lay, but hen is unable to perform the function. Restlessness, evidence of distress; in the latter stages, dullness, roughened plumage, indisposition to move. On examining bird by pressure of the finger, egg may be distinguished as a hard body in the posterior part of the abdominal cavity. When prolapsus exists the everted oviduct protrudes.

Treatment.—In early stages before case has become too aggravated it is sufficient to inject small quantity of olive oil and gently manipulate the parts. Thereupon give cooling feed; if hens are too fat reduce the feed ration and add to it Davis Poultry Food in proportion of one tablespoonful to every twenty hens.

In case the expulsion of the egg cannot be brought about by oil injections, immerse the vent and lower part of the body in water, as warm as can be used without injury, and keep it immersed for half an hour until the parts are relaxed. Now inject oil and endeavor to assist bird by careful pressure and manipulation or by dilation of the passage. Fluid extract of ergot is useful in cases of this nature and may be administered in 5-drop doses three times a day. It may at times be necessary to puncture the egg, allow the contents to escape, crush the shell and remove the pieces.

Gangrene of the Oviduct.

If an egg arrested in the oviduct cannot be expelled, inflammation is produced, becoming more and more pronounced, at last causing death of the tissue. Decomposition and putrefaction of the flesh sets in, and this is called gangrene.

The walls of the oviduct are easily torn when gangrenous and the egg may then escape into the abdominal cavity. No treatment is possible for this condition and death will occur in a short time.

Rupture of the Oviduct.

Even if no gangrene or inflammation exists the walls of the oviduct are at times torn or ruptured as the result of strong contractions in the efforts to expel an abnormally large egg. A fissure may appear, allowing the egg to escape into the abdominal cavity. The trouble may be discovered from the suspension of laying and enlargement of the abdomen. Pressure of the finger will discover one or more eggs in the lower part of the abdomen. No treatment is possible, and it is best to kill the bird as soon as this condition is recognized.

Cloacitis, Vent Gleet.

Contagious catarrh of the cloaca at times occurs in birds, and it may be transmitted from bird to bird during the act of copulation. In severe cases the trouble may extend to the mucous membrane of the lower part of the oviduct, and even to the rectum.

Symptoms.—Early symptoms are frequent passages of excrement voided in small quantities. The bird sometimes tries to drop excrement when cloaca is empty. This is caused by tenderness and irritability of the cloaca, giving the fowl the sensation of fullness, producing spasmodic contractions. On examination the mucous membrane in the early stages is found to be red, dry, swollen and hot. First it is thin and watery, then turns into white and becomes purulent and offensive. After a few days a discharge makes its appearance, collecting upon the skin and feathers, obstructing the passage, and irritating parts with which it comes in contact. Soiled skin becomes red and inflamed and sores and ulcers may occur from the birds picking at it or from friction.

Treatment.—Clean the parts and reduce the inflammation by holding lower part of bird's body, including vent, in vessel of warm water in which has been dissolved a tablespoonful of bicarbonate of soda to each quart of water. Water to be as warm as can be comfortably borne by the hand. The application should last for one-half to three-quarters of an hour, repeating daily until the inflammation subsides. After the fowl is removed from the water, dry carefully with the following mixture injected into the cloaca: Water 6 ounces, glycerine 2 ounces, morphia sulphate 1 grain, boric acid $1\frac{1}{2}$ grains. A small piece of cotton may be saturated with this mixture and inserted in the cloaca two or three times a day, leaving it there until expelled by the fowl. In case the discharge is offensive a solution of permanganate of potash 1 grain to each ounce of water may be used as an injection, or, if this is not on hand, a solution of peroxide of hydrogen may be substituted. If these remedies fail to give satisfactory results, try a solution of Phenalin of the strength of 1 per cent. After the inflammation has been overcome, if the discharge keeps on, an astringent solution consisting of acetate of lead 4 grains to an ounce of water may afford relief. In severe cases acetate of lead 3 grains, sulphate of zinc 3 grains, and water 1 ounce may be used with good results. All sores and ulcers should be kept clean and dust free.

Parasites in Eggs.

In the course of its travel through the oviduct, it is not difficult to understand that the egg may absorb, in the different layers of albumen it here is provided with before the shell is formed, any parasite which has gained access in some way to this tube. This parasite thus becomes imprisoned with the albumen in the shell. The parasite most frequently found in the egg is the *Cephalogonimus ovatus* (*Distoma ovatum*). More rarely the common round worm known as the *Heterakis perspicillum* (*Heterakis inflexa*, *Ascaris inflexa*) is encountered. The two worms mentioned apparently pass into the oviduct from the cloaca. The chicken cholera bacillus and perhaps also the bacilli of fowl diphtheria and avian tuberculosis may also be found in eggs. As all these parasites are killed by a comparatively low temperature, and absolutely so by cooking, their existence need not cause anyone to avoid eggs as an article of diet. The presence of certain micro-organisms in eggs, however, leads to early decomposition. Cleanliness and sanitary conditions in the yards are essential to the production of good eggs.

Sanguineous Eggs.

At times small blood clots may be discovered in eggs, most often in the albumen. This is caused by a slight hemorrhage, generally occurring in the upper part of the oviduct. Rare instances are recorded in which the hemorrhage took place within the ovary. When this is the case the blood will be found either upon the surface or within the yolk. These conditions may be counteracted and overcome by including plenty of green feed with the daily ration and feeding the birds Davis Poultry Food with each meal.

In special cases medium doses of perchloride of iron or ergot will be found beneficial. Plenty of fresh air, a free run, and cleanliness in yard are essential.

Eggs Without Shells.

This phenomenon is due either to a lack of shell making material or to inflammation of the shell forming chamber of the oviduct. Fright may also cause premature expulsion of an egg before the shell has been formed. Shellless eggs are more difficult to lay than perfect ones; for which reason they often are retained for a considerable period in the uterus, enhancing the inflammation and irritation. Removing of the cause is the proper treatment for this trouble. Give the bird plenty of shell forming material, such as Davis Crushed Oyster Shells, Davis Crushed Clam Shells or Davis Mico Spar Cubical Grit. Wheat bran and a plentiful allowance of green feed to avoid inflammation of the oviduct should be included in the ration.

Eggs With Two Yolks.

Sometimes eggs containing two yolks are laid. They are the result of two ovarian capsules becoming ruptured at about the same time, the yolks descending the oviduct so near together that they both become encased in the same shell. They are generally larger than normal eggs, and the danger of their causing injury to the oviduct is greater. Some hens are habitual layers of such eggs. If incubated double yolk eggs as a rule produce twins, double chicks or monsters. Sometimes, however, a single yolk egg may contain two germs and give birth to two embryos, united in some part of the body, as is often the case with the two-yolk eggs.

Aborted or Incomplete Eggs.

Often hens drop eggs of miniature size, productions about as large as a pigeon's egg, with a shell sometimes more dense than the ordinary. They contain albumen, but no yolk. At times they contain little more than the albuminous membranes, so tightly twisted that they have been taken for worms. The production of these small eggs shows that an irritation exists in the central part of the oviduct. Albumen is secreted without the normal stimulus given by the presence of the yolk, and passing down the tube to the uterus is there covered with a shell. The fowl laying such eggs should be removed from the flock, kept quiet and treated as recommended for inflammation of the oviduct.

Eggs Within Eggs.

This phenomenon is related to the one just considered and is of frequent occurrence. The enclosed egg is a small one, encased in a shell and containing only albumen. It is produced by irritation of the central portion of the oviduct, causing albumen to be secreted without the presence of a yolk. This albumen is pressed by the contractions of the tube downward to the uterus, where a shell is deposited upon it. In the effort to expel this small egg irregular contractions are induced, which force it upward for a certain distance, where it meets a yolk surrounded by albumen, or a second mass of albumen without a yolk, becomes imbedded in this soft albumen and a membrane and shell are formed around the whole. The compound egg thus formed is usually of normal size. These abnormalities are in reality easily explained and understood, and the careful poultryman should draw the deduction from their frequent repetitions that his fowls are being forced beyond safe limits.



DISEASES OF THE BRAIN.

Among Diseases of the Brain are Cerebral Hyperemia, Congestion of the Brain, Apoplexy, Epilepsy.

Congestion of the Brain, General Hyperemia, Vertigo.

Congestion of the brain is a disease very frequently met with in poultry. Fat and plethoric birds incur it through fright or faulty digestion; irritation of the intestines by parasitic worms is also often the cause. Male birds during the breeding season are most often affected, and chickens exposed to the hot rays of the sun are liable to contract it. Blows upon the head and a complication with infectious diseases such as cholera are other causes.

Symptoms.—Giddiness, leading the bird to throw its head upward and backward, or to bend the neck to one side; gait is staggering and uncertain; bird may be seen walking backward, sidewise or in a circle. Sometimes the bird falls to the ground fluttering and making convulsive movements with the legs, or may lie for some minutes, powerless to move. Stupor and drowsiness are other symptoms.

Treatment.—Apply cold water or ice to the head and hold it in position until the head is thoroughly cooled. Give internally 30 grains of Epsom salts, or $1\frac{1}{2}$ grains of calomel, or 2 teaspoonfuls of castor oil. Keep the affected bird in a cool, quiet and shady place. Include Davis Poultry Food with the regular ration. If there is not entire recovery under this treatment, try bromide of potassium 1 to 5 grains three times a day dissolved in a tablespoonful of water. If intestinal parasites exist, dislodge these by appropriate remedies.

Hemorrhage of the Brain, Apoplexy.

Rupture of a blood vessel of the brain and pressure of escaped blood is the cause of apoplexy. Stimulating feed, overfeeding and mechanical injuries, violent exertion and straining in the laying of eggs are the most frequent causes.

Symptoms.—The trouble is not marked by any premonitory symptoms. The attack is instantaneous, causing entire or partial insensibility, and the bird dies upon the nest.

Treatment.—The treatment should be preventive. Regulate the rations, give plenty of exercise, green feed and Davis Poultry Food. In most cases treatment is impossible, as the bird dies before it can be administered. In milder cases use same treatment as recommended for congestion of the brain.

Epilepsy.

This disease is characterized by convulsive attacks, with loss of consciousness, occurring from time to time, and commonly known as fits. It may be caused by pressure upon the brain (tumors), intestinal parasites, etc. In many cases no visible cause can be discovered.

Symptoms.—When stricken the bird falls to the ground. Legs and wings are moved convulsively. It may lie upon its back or abdomen, with legs spread, head thrown back, bill and eyelids opening and closing alternately, and eyeballs turned backward. In a little while the attack is over and the fowl resumes its natural appearance.

Treatment.—Bromide of potash 3 to 5 grains two or three times a day. Except in cases where the ailment is caused by intestinal worms treatment as a rule is not successful, and unless the bird is very valuable you had better kill it.

DISEASES OF THE HEART AND BLOOD VESSELS.

To This Group of Diseases Belong Pericarditis, Inflammation of the Pericardium, Dropsy of the Heart Sac; Endocarditis, Inflammation of the Internal Membrane of the Heart; Hypertrophy of the Heart; Rupture of the Heart and Large Blood Vessels.

Pericarditis, Inflammation of the Pericardium, Dropsy of the Heart Sac.

This is a common disease among poultry, and is often associated with inflammation of the lining membrane of the heart, lung inflammation and soreness of the joints. It is supposed to be of a rheumatic nature.

Symptoms.—Great weakness; hard breathing; the head is generally thrown backward and the breathing done through the mouth. If stirred to run the bird quickly stumbles and falls.

Causes.—Post mortem examination finds the pericardium or heart sac distended, with a large quantity of liquid attendant upon the inflammation. Sometimes thick false membranes exist, adhering to heart and pericardium, at times uniting the two.

Treatment.—Generally the disease is not discovered until after death when bird is examined. A number of cases in the same flock indicates exposure to sudden changes in temperature or to extreme cold and dampness. These conditions should be done away with. Give 2 to 4 grains of bicarbonate of soda to each bird daily in the drinking water. Give plenty of green feed and mix Davis Poultry Food with the ration daily.

Endocarditis, Inflammation of the Internal Membrane of the Heart.

Much less frequently than the pericardium, still often enough to be worth noting, the delicate membrane that lines the interior of the auricles and ventricles of the heart is subject to inflammation. The symptoms are the same as those in pericarditis. Post mortem examination divulges the internal surface of the heart reddened, and deposits of coagulated lymph are present. The treatment recommended for pericarditis in fowls is applicable to this trouble also.

Hypertrophy of the Heart.

This disease is most frequently seen in pigeons, but other fowls are not exempt. It appears to be due largely to great timidity, as shown by pigeons, where the least fright is apt to cause palpitations.

Symptoms.—Violent beating of the heart, sometimes so pronounced as to cause rupture of blood vessels and the escape of blood from several parts of the body at the same time. The walls and valves of the right side of the heart are most frequently affected. No treatment except preventive, in the form of strengthening, nourishing feed, with Davis Poultry Food added to each ration, is of any value in this disease.

Rupture of the Heart and Large Blood Vessels.

This trouble, together with fatal hemorrhage, is common with fowls. Among the causes are overexertion in attempting to escape when chased, compression of small birds in the hands, and other injuries. It appears most frequently in plethoric, full blooded fowls. Diphtheria is known to have produced it in a few rare instances. The trouble is followed with instant death, and cannot be foretold or treated. Preventive, strengthening measures are all that can be recommended. Add Davis Poultry Food to each ration in order to increase the digestive and assimilative powers of the birds.

PARASITES AND DISEASES OF THE SKIN.

Among the Most Prominent Skin Diseases are Those Caused by the Epizoa or Parasites Living upon the External Surface of the Body: Scabies or Mange of the Body; Scabies Caused by Epidermoptes; Scabies Caused by Sarcoptes; Depluming Scabies; Favus; Chicken Pox; Sore Head; Pigeon Pox.

The Epizoa or Parasites Living upon the External Surface of the Skin. One of the great troubles attendant upon the keeping of domesticated fowls is their proneness to become infested with various kinds of external parasites or vermin. These minute organisms, living upon and drawing their sustenance from the external surface of the bird's body, are grouped as epizoa. It is impossible here to give more than a general account of the many different species existent. In the list below we also give the technical or scientific name, the popular name (when possible), and the kind of bird which the different parasites commonly infest:

Group I. Epizoa Which Suck Blood or Gnaw the Flesh.

Pulex avium. The bird flea. Fowls, pigeons and many other birds.
Acanthia columbaria. Dovecote bug. Fowls and pigeons.
Dermestes lardarius
Tenebrio molitor } Larva
Necrophorus } Various of
Silpha } species } Coleoptera } Young pigeons.
Argas reflexus. Pigeon tick. Pigeons.
Leptus autumnalis. Harvest bug. Fowls.
Dermanyssus gallina. Red mite. Poultry, pigeons and other house birds.

Group II. Epizoa Which Cause Scabies or Mange.

Epidermoptes bifurcatus. Fowls.
Epidermoptes bilobatus. Fowls.
Sarcoptes lavis, var. *gallinae*. Scab mite. Fowls, guinea fowls, turkeys and cage birds.

Group III. Epizoa Which Live in the Connective Tissue or Air Sacs.

Cytodites nudus. Air sac mite. Fowls.
Harpirhynchus nidulans. Connective tissue mite. Pigeons.
Laminosioptes cysticola. Connective tissue mite. Fowls.
Falciger rostratus. Pigeons.

Group IV. Epizoa Which Live upon or Within the Feathers, or upon the Skin, Some Being Inoffensive, While Others Injure the Plumage or Cause Itching.

Goniodes dissimilis. Louse. Fowls.
Goniodes stylifer. Louse. Guinea fowls and turkeys.
Goniodes falcicornis. Louse. Peacocks.
Goniodes minor. Louse. Pigeons.
Goniodes numidianus. Louse. Guinea fowls.
Goniodes parviceps. Louse. Peacocks.

- Goniocotes gigas*. Louse. Fowls.
Goniocotes hologaster. Louse. Fowls.
Goniocotes rectangulatus. Louse. Guinea fowls and peacocks.
Lipeurus anatis. Louse. Ducks.
Lipeurus anseris. Louse. Geese.
Lipeurus caponis. Louse. Fowls and Guinea fowls.
Lipeurus columba. Louse. Pigeons.
Lipeurus crassicornis. Louse. Geese.
Lipeurus heterographus. Louse. Fowls.
Lipeurus numida. Louse. Guinea fowls.
Lipeurus meleagridis. Louse. Turkeys.
Menopon numida. Louse. Guinea fowls.
Menopon biseriatum. Louse. Fowls and turkeys.
Menopon latum. Louse. Pigeons.
Menopon pallidum. Louse. Fowls.
Menopon phaostomum. Louse. Peacocks.
Docophorus icterodes. Louse. Ducks and geese.
Trinoton anseris. Louse. Geese.
Trinoton continuum. Louse. Geese.
Trinoton luridum. Louse. Ducks.
Trinoton lituratum. Louse. Geese.
Colpocephalum turbinatum. Louse. Pigeons.
Cheyletiella heteropalpa. Mite. Pigeons.
Syringophilus uncinatus. Mite. Peacocks.
Syringophilus bipectinatus. Mite. Fowls, Guinea fowls and pigeons.
Dermoglyphus elongatus. Mite. Fowls and Guinea fowls.
Dermoglyphus minor. Mite. Fowls and Guinea fowls.
Dermoglyphus varians. Mite. Guinea fowls.
Freyana anatina. Mite. Ducks.
Freyana chanayi. Mite. Turkeys.
Megninia asternalis. Mite. Fowls and pigeons.
Megninia cubitalis. Mite. Fowls.
Megninia ginglymura. Mite. Turkeys.
Megninia velata. Mite. Ducks.
Pterolichus obtuses. Mite. Fowls.
Pterolichus uncinatus. Mite. Turkeys.
Pterophagus strictus. Mite. Pigeons.

General Remarks.

In the preceding list we have collected into groups, as epizoa which suck the blood or gnaw the flesh, a number of parasites which produce somewhat similar effects, although, speaking zoologically, these pests vary quite distinctly. However, they have in common that they do not remain constantly upon the birds,

most of the varieties hiding in the roosts or houses during the day and coming out from their concealment to make their attacks during the night. Their method is to puncture the skin and suck the blood for their nourishment. One parasite, the larva of the coleopterous, gnaws the skin and even the superficial muscles of the neck and abdomen of young pigeons, producing serious wounds and sometimes death.

The common bird flea mostly makes pigeons its prey and only rarely attacks fowls. The so called dove-cote bug closely resembles the ordinary bed bug, and some even hold that it is identical with it. Once infected with this parasite, the pigeons suffer greatly, as it spreads rapidly and is extremely pernicious in its effects. The tick also lives in the pigeon cotes, hiding during the day in the cracks and holes and appearing at night to attack the birds. Young pigeons are the preferred victims, and so much blood is sucked from them that they die from exhaustion in from ten to fifteen days. These

parasites may wander a considerable distance, and are at times found in adjacent poultry houses and even in dwelling houses. They attain a considerable size, and the mature females are about one-fourth of an inch in length. They are said not to trouble fowls, but, as they sometimes bite children, or even grown persons, it would be but little surprising if it were found that they occasionally also attack poultry. This tick lives for a long period without food of any kind, and may subsist for generations on dead organic matter. Once established it is therefore a troublesome pest and hard to do away with wherever lodged.

Another of the common parasites, the harvest bug, is a small, red insect about 1-60 of an inch long, usually making its appearance in the summer and fall. Small animals are its usual victims, but it may attack and swarm upon man if he invades its habitat. It punctures and even penetrates the skin, causing small swellings. Fowls at times are attacked, the effects being most serious with chickens hatched late in the summer or autumn. The parasites fix themselves to the skin at the base of the feathers, causing such intense irritation as to induce epileptiform symptoms, leading to death in a few days.

The *Dermanyssus gallinae*, or red mite, undoubtedly is the most common and perniciously active of all the vermin that attack birds. It is from 1-35 to 1-40 of an inch in length, yellowish white or dark red in color, depending upon whether it is fasting or more or less filled with blood. By day it hides in crevices and corners of the buildings, nests, perches, floors, where it may be discovered in great clusters. At night the individuals composing these clusters distribute themselves over the birds, and by pricking the skin and sucking fill themselves with blood. Both on account of the blood which is extracted and the itching, pain and unrest attendant upon their activity are these parasites harmful to their victims. Young pigeons, chickens and cage birds are the greatest sufferers from their attacks, and many die from exhaustion when infected. Usually it confines its operations to the night, but in severe cases fowls may be infested both night and day. Man and horses may also be bitten by the red mite when it gets upon them; in fact, all animals stabled near the poultry house are liable to be attacked. It will cause horses to rub and bite themselves, the hair over the infected spots is lost, and there appears an eruption similar to that following the bite of common mange. Considerable itching and some irritation follow its attack upon human beings.

All the epizoa mentioned in the second group are mites. The *Epidermoptes* produce a sort of scabies, distinguished by the production of dry, grayish yellow crusts or scales. The disease is seen on any part of the body except the head, where it but seldom occurs.

The *Sarcoptes lavis* is the parasite that produces the true form of scabies on pigeons and fowls. The skin is but slightly affected, but the feathers break and are shed from the affected spots.

As the animal parasites which live in the connective tissue and air sacs are all mites they might, perhaps, properly be placed among the entozoa. Many of them pass a portion of their existence upon the surface of the body. It is therefore the best way to consider them together with the other mites. The *Cytodites nudus* breeds in the air sacs and connective tissue of fowls and pheasants. They are found in the trachea, bronchi, lungs and the various air sacs, including those of the bones. In small numbers these mites are not very injurious, but badly infected birds become anaemic, lose flesh, stop laying eggs, show catarrhal symptoms, and droop and die.

The *Harpirhynchus nidulans* makes its habitat in the tumors of the skin on pigeons and sparrows. It is comparatively harmless when present in limited numbers, but when very numerous the nutrition becomes impaired, there is a noticeable loss of flesh, followed in many instances by death.

The *Laminosioptes cysticola* takes up its abode and breeds in the connective tissue of the Gallinacea, where it often causes irritation and the formation of tubercles, in the center of which the mites are located. When the number of mites is small no great harm ensues to the animal infected, but when large the usual symptoms produced by the epizoa—bloodlessness, loss of flesh, weakness and death—become evident.

The *Falciger rostratus* is a pigeon parasite really belonging to the group of the feather mites. It is able to introduce itself into the connective tissue beneath the skin, entering this by way of the feather follicles, to remain there for a portion of its life.

In the fourth group of epizoa living upon, within or among the feathers (but which do not bite or puncture the skin), we find included a long list of lice and mites. The lice of birds belong exclusively

to the pennivorous varieties; that is, they subsist upon the feathers, but do not suck the blood. It is a noteworthy fact that the entire group of blood sucking lice lives upon the mammalia. When chicks are hatched under hens they nearly always have lice upon them, located upon the head and under the throat, where they have fixed themselves to the feathers close to the skin, for which reason they often, under a superficial examination, are mistaken for pin feathers. When badly infested, they also may be found under the wings and about the vent. Different kinds of lice may be found at one time upon the same bird, and it may be added that each species of birds has its own species of lice. The lice are more or less injurious to the plumage of the victims and cause itching by roaming over the skin. They also prevent the birds from obtaining proper rest and sleep. The mites of the fourth group cause little or no inconvenience to the birds which they infest. Some live between the barbules of the feathers, others live within the quills, and these are sometimes called feather mites. The *Cheyletus* lives at the base of the feathers. The *Syringophilus* lives within the quills of the tail, the wing and the wing coverts. The quills of the affected feathers lose their transparency and are filled with an opaque powder, which upon microscopical examination is found to consist of the parasites, their excreta, the skin which they have shed and the debris of the interior of the quill. It is supposed that this alteration of the feather has no effect upon the health of the bird. The *Dermoglyphus* and *Pterolichus* also are located within the quills. The above mentioned members of the various groups are the ones most commonly encountered in poultry and birds.

Symptoms.—Little chickens are sickly, do not thrive, and, if severely infested, they will gradually languish and die. Grown birds, when badly attacked by external vermin of this kind, lose flesh, skin and comb become pale and bloodless; the fowls are picking, scratching and dusting themselves almost all the time. They are restless both by day and night, lose comparatively large quantities of blood, and rapidly become emaciated. Sitting hens forsake their nests, the feathers break and drop out, the skin becomes abraded and sore, the afflicted fowls cease to thrive, their egg production is greatly diminished or altogether arrested, and every now and then a bird is found dead. A careful opening of the feathers located about the head, neck or under the wings, also about the vent, will disclose the vermin moving about. If care is not taken persons going about the roosts will be covered with the lice, and an examination of the roosts and cracks of the building will bring to light dense clusters of the red mites, some of them light yellow, but the majority dark red and gorged with blood. The presence of such pests as the bird flea and the dove-cote bug can only be determined by a close examination of the poultry houses and pigeon cootes. Sores upon the breast and neck of young pigeons indicate the presence of parasites. Ticks are indicated in the majority of cases by a number of these parasites attaching to the skin of some part of the bird's body. If the skin is irritated, inflamed, or covered with scurfs, scales and crusts, with loss of feathers, or if the feathers are shed when the birds are not normally molting, they should be examined for the mite which causes scabies. Should the legs become enlarged, roughened and scaly the effects of the *Sarcoptes mutans* are evidenced. In the same way the discovery of small nodules in the skin or of miliary tubercles on the serous membranes, in the connective tissue, lungs or other organs, should be followed with a hand lens to determine if connective tissue mites are the cause.

Diagnosis.—If a careful search is made for the parasites or vermin, determination of the nature of such disorders is easy and unmistakable. Nevertheless birds often are unthrifty, leave their nests, or even die from the effects of lice or mites without the cause being discovered; the reason being that their owners either forget to look for the parasites, and attribute their ailment to cholera, or if they observe a few lice they conclude that these are always present with fowls and do not give the matter a second thought. It is only after a thorough examination of the roosting places by taking down the roosts and removing the loose boards, thus discovering the parasites, that the trouble is recognized and understood. External animal parasites are always the most common and frequent cause of trouble in the poultry yard or pigeon cote. Always when the birds appear abnormal look for these pests at once, repress them, and you will be surprised with the improvement made on your flock. Just as when a horse breaks down the maxim is to examine his feet; so, when anything seems wrong with the birds, your first thought should be to look for lice.

Causes.—Contagion is responsible for the louse plague; the vermin is introduced in the poultry house, breeding rapidly under favorable conditions. The second generation from a single louse may

number 2,500 individuals, while the third may reach the enormous number of 125,000. All these may be produced in the course of eight weeks. Remember, therefore, that, although birds when you examine them may have only a few lice upon them, a few weeks after, if circumstances have been favorable, may find them covered with vermin, emaciated and exhausted. Not long ago the popular belief prevailed that the generation of lice was spontaneous, resulting from accumulations of dirt and filth. It, however, is not so. It is admitted by all scientists today that every living thing is descended from a living parent of the same nature. You may therefore safely put away the old superstition.

It is easy for experienced people to distinguish the different species of lice and mites from one another. Their special traits are handed down from generation to generation, and they always infest the same species. Turkeys, hens, pigeons, ducks, geese and guinea fowls all have their own species of lice, respectively, living upon them alone. Few species of lice live upon more than one species of birds. It is therefore possible to multiply lice through favorable conditions, but impossible to generate them without parent parasites.

The breeding and multiplication of lice are due in a large measure to the poor condition of the birds and filthy, unsanitary surroundings. Birds poor in health and vigor may be found literally covered with them when healthy members of the flock are comparatively free; in fact, there are birds so strong and healthy that vermin cannot thrive upon them. On the other hand, poor condition, accumulations of dirt and filth, close confinement of the birds, lack of dusting places, buildings with cracks and crevices in which insects may hide, and damp, dark and badly ventilated houses all favor the development and multiplication of vermin. And even if the poultry yard is kept practically free from these pests there is always danger of their being introduced by purchased fowls, or by birds that have become infested at shows and other strange places. It should therefore be guarded against with the same care and vigilance as all other infectious and easily communicable ailments.

Treatment.—No better remedy in the world exists for the combating and quick and thorough extermination of all kinds of lice and parasites than Brisbane's Death to Lice. It is an absolutely sure, as well as harmless, remedy, which we earnestly and conscientiously can recommend to every farmer and poultry raiser. When it is used in accordance with the simple directions given with each package, and the necessary sanitary conditions of the yard are carefully observed, you will have no more trouble or loss from this source. The existence of lice among your hens and other fowls will soon become a thing of the past. It is included among the Davis Preparations and has been selected for its place in this list of standard stock foods and remedies only after the most thorough, practical tests. It is put up for the convenience of the purchaser in strong, round one-pound boxes, provided with a sprinkler top, enabling you to use the powder without removing the lid. Full directions for its use are given with each box. The price per pound box is 25 cents. If your birds are in any way affected with parasites you can do no better than to give it a trial.

Young chickens hatched under a hen almost always are infested with lice, and should be treated as soon as removed from the nests. If Brisbane's Death to Lice is not at hand try pure lard. Rub it carefully into the feathers on the top of the head, under the throat and around the vent. Pure lard is harmless and as a rule will kill the lice, consequently it is a good thing to use on small chicks. Also rub a small quantity under their wings—but not before the chicks are a couple of weeks old. Unless the incubator has in some manner become infested, chickens hatched with it should be exempt from lice. It is well, however, to occasionally examine incubator chickens also, as the brooder or incubator may have become contaminated with the vermin. In connection with the directions given on the package a few general rules are here added for the treatment of birds infested with parasites:

Older birds, excepting the hens with young chickens, may be anointed about the heads and under the wings, also under the vent, with lard in which Brisbane's Death to Lice is mixed. The operation may best be performed by holding the bird by the legs, head downward, so that the tendency of the feathers will be to fall away from the body. Then apply the powder thoroughly with the sprinkling box in which it is contained. If the bird is held over a large piece of paper the powder which fails to adhere to the feathers and skin can be saved and used a second time.

If Brisbane's Death to Lice is not at hand try dipping the infested fowls in a solution of warm water containing 1 per cent of Phenalin. This solution is made by mixing $1\frac{1}{4}$ ounces of pure Phenalin with 1 gallon of warm water. Larger quantities may be made in the same proportion. The solution should be allowed to cool and then put in a vessel suitable for immersing the birds to be treated. The fowls should be held in this liquid for about a minute, and care should be taken to wet every portion of the body, including the head.

In order to obtain the desired results, the complete and permanent extermination of all harmful parasites of the birds, the buildings in which they are confined must receive careful attention. Thorough sanitation and hygienic measures are necessary if you would have a clean, healthy and fine looking flock, capable of yielding large profits. The droppings should be removed carefully and mixed with fine, dry road dust, ashes or lime. Fine dust destroys the lice and should therefore be used plentifully about the yard, and given to the fowls in boxes so big that they are able to give themselves a thorough dust bath whenever desired. Brisbane's Death to Lice may be mixed with the dust in these boxes in order to render it still more deadly to the vermin. Scrape the floor of the poultry house and pigeon cote thoroughly, and cover it with fresh sand or road dust. The roosts and all loose pieces of wood should be removed, and then the whole inside and also the parts which have been removed should be sprayed with a solution made by dissolving 3 ounces of Phenalin to a gallon of water. Once a year, at least, the inner woodwork and walls should be given a good coat of lime wash to which 3 ounces of Phenalin to each gallon of water has been added. The nest should also be cleaned out, drenched with boiling water or carbolic solution, and when dry sprinkled with insecticide powder (Brisbane's Death to Lice) and bedded with fresh straw. The treatment recommended above, if carried out in a thorough manner, using Brisbane's Death to Lice in the way indicated, will soon bring the troublesome external parasites under control, either thoroughly eradicating them or diminishing their number to such an extent that they will become harmless. There are a number of other popular methods in the way of disinfection which have been found valuable, and of which we give a few of the more common ones here. Some throw dry lime dust against the roof and walls of the buildings; others fumigate by burning sulphur and leaving the doors and windows closed for a few hours, there being, of course, no birds left inside at the time; others, again, fumigate by placing open bottles of bisulphide of carbon about the poultry house. Anise seed is disagreeable or distasteful to most of the parasites of birds, and is an excellent remedy when powdered and dusted into the feathers, or when strewn into the boxes. A small quantity of essential oil mixed with water renders this more effectual in destroying the mites about the roosts, nests and other woodwork, and roosts should be painted with Dr. Brown's Lice Killer. The essential oil may also be mixed with olive oil and rubbed upon those parts of the birds most frequented by lice; and, in case of catarrh caused by the red mite, the mixture may be introduced into the nasal passages with a small feather.

If the larva of the Coleoptera, which already has been specified, should attack the young pigeons, clean the houses as thoroughly as possible, use Brisbane's Death to Lice or Dr. Brown's Lice Killer according to the directions, and strew the floors and nests with a mixture composed of equal parts of pine sawdust and sand.

In the same way, when the Argas or pigeon tick is introduced upon the premises, it must by all means be exterminated as quickly as possible. The ticks should be carefully picked from the birds so that the head (rostrum) will not be left in the wound. They should then be crushed and burned. The infested pigeon cotes should be thoroughly cleansed, scalded and whitewashed. Brisbane's Death to Lice should at the same time be freely used upon the birds and Dr. Brown's Lice Killer applied to the nests and cotes. The same holds good in the case of the harvest bug. To destroy it and permanently keep it away from your birds, use Brisbane's Death to Lice and Phenalin, carbolic or sulphur ointment.

For Epidermoptes use Phenalin dips, sulphur ointment and Brisbane's Death to Lice. The mites which live in the air sacs and connective tissues can only be destroyed by frequent applications of Brisbane's Death to Lice, and a religious observance of all the details necessary to insure cleanliness. All badly affected birds should be killed and their carcasses burned. This is the most difficult parasitic disease of birds to overcome.

Scabies or Mange of the Body.

There are two known varieties of mange affecting the bodies of domesticated birds. One form is attributed to mites of the genus *Epidermoptes* and the other is known to be caused by the *Sarcoptes*. There is a marked difference in the two kinds, and they are therefore best described apart.

Scabies Caused by Epidermoptes.

Several specialists have observed and described the two species, named *Epidermoptes bilobatus* and *Epidermoptes bifurcatus*. Their presence is generally coincident with mange like diseases of the skin, although they have been found upon birds apparently free from this disease. There is, therefore, some doubt as to whether these parasites produce scabies or whether they are harmless. The majority of evidence, however, so far indicates that they are the cause of the trouble, and it is therefore attributed to them. The *Epidermoptes* are very small acarina, or mites, which generally live in the soft plumage, or down, at the surface of the skin. As a rule they are not very numerous, but under favorable conditions multiply enormously. The skin of the entire body, head excepted, becomes irritated, scurfy, and covered with large, thin, yellowish or grayish scales or crusts, accumulating particularly at the base of the feathers. The head may be affected in rare instances. Appearance of the affected parts resembles closely that seen in favus, the disease caused by the vegetable parasite known as the *Anchorion schonleinii*. Some think that the disease is due to this fungus and that the mites are innocent of pathogenic action. Future investigation must determine this.

Scabies Caused by Sarcoptes. Depluming Scabies.

This trouble is caused by the mite known as the *Sarcoptes lavis*. The parasite found on the pigeon is not exactly the same as that found upon the fowls, although both belong to the same species. The pigeon parasite is known as the *columba* and the fowl parasite as the *gallina*. The disease is most common in the spring and summer, disappearing in the fall when the birds molt, and does not reappear before springtime. Principal symptom is loss of feathers, causing spots on various parts of the body. Feathers break off at the surface of the skin. At root of feathers is seen a small mass of epidermic scales which can easily be crushed into powder. Microscopical examination of this powder reveals numerous mites and the debris which they produce. Disease appears in poultry yards as a consequence of one or more birds being affected. It develops rapidly—a whole flock is contaminated in a few days. Starts usually on the rump, the transfer of the contagion being effected by copulation, and spreads rapidly to the back, thighs and belly. An infested cock will rapidly infect all the fowls in a poultry yard.

Treatment.—Exhaustive experiments made by experts with various remedies demonstrated that no better treatment exists than Brisbane's Death to Lice, used according to the directions given with each package. It is a speedy, sure and inexpensive cure, and if its use is persisted in the trouble is not very difficult to overcome. If the owner does not happen to have this preparation on hand, try a home made ointment of Phenalin or carbolic acid, made by mixing one part of either of these substances with ten parts by weight of lard or vaseline. Do not cover a very large part of the body with strong carbolic acid preparations, as this may cause poisoning by absorption.

Favus.

This trouble is generally known as white comb or baldness. It is caused by a fungus named the *Achorion schonleinii*, which also attacks human beings, cats, dogs, mice and rabbits. When it affects man the disease is known as *tinea favosa* and *favus*, the latter name generally being used. As a disease of man this parasite was first discovered by Remak in 1837 and more completely demonstrated by Schonlein in 1841.

Symptoms.—This skin disease, named *favus*, in birds usually starts on the comb or other fleshy parts of the head, gradually extending to and affecting all parts of the body. Rare instances find it beginning upon the body before head is affected. Symptoms are small white, light gray, round or irregular spots, from size of pin head to that of dime, extending and increasing in number until nearly all of the skin of the affected parts is covered. Examination of spots shows that a thin scale or crust has formed on the surface of the skin. This crust often develops in round or concentric deposits, raised at the border and depressed at the center, giving to the spots a cup shaped appearance. It increases in thickness until

in the course of a month it may be $\frac{1}{4}$ of an inch or more in depth. It is then of a dirty white color, scaly and irregular on the surface. When crust is removed skin is seen to be irritated and slightly excoriated. Disease spreads from the bare parts of the head to the parts of the body covered with feathers. The neck, the region about the vent, and the adjoining surface soon become invaded. The feathers are dry, erect and brittle, they break and fall off, leaving the skin denuded and covered with crusts, which are often cup shaped, with the depression in which the feather was fixed left in the middle. The health of the bird at first is not visibly affected, but as the disease spreads it gradually falls into a decline, continuing until the vitality of the body is exhausted and it dies. A disagreeable odor attends the disease.

Causes.—This contagious disease, as already stated, is caused by a fungus named *Anchorion schonleinii*. It may be inoculated from bird to bird; perhaps also from mice, rats, rabbits, cats and dogs to birds. On the other hand, it may probably also be communicated from birds to these animals and to children. Some specialists hold that the poultry favus is a distinct form of the general disease and not communicable to mammals, but the weight of evidence favors the conclusion that the disease in all of these species is intercommunicable, and, in fact, identical.

Treatment.—In the treatment of favus Phenalin has proved itself an excellent remedy. It yields readily to this remedy when used in the proper way. It should, if possible, be applied immediately, when the disease is still confined to the head. At this period it is comparatively easy to handle, but after it has spread to parts covered with feathers, or affected the plumage, it becomes much more difficult and serious. In using Phenalin it is important that the remedy should penetrate beneath the crusts to the skin. To secure this the crusts may be rubbed off as thoroughly as possible with a blunt instrument, such as the handle of a spoon. Do this gently, so as not to cause bleeding. After the crusts are removed, dress affected parts once a day with Davis Carbolic Salve. It is well to keep this remedy at hand at all times in order to have it ready for any emergency; but, should the owner not happen to have it at the moment, try any of the following preparations, which can be made at home with drugs purchased at the drug store: Tincture of iodine; benzine, 1 part; soft soap, 20 parts; mix thoroughly before using. Or try carbolic acid, 1 part; soft soap, 20 parts; mix thoroughly. Do not apply the carbolic preparation to any large surface at one time, as the acid may cause poisoning by absorption. Another good ointment may be made with either calomel or red oxide of mercury, 1 part to 8 parts of vaseline. If the disease is very severe, a more active but also more dangerous remedy may be made by mixing 3 grains of nitrate of silver with $\frac{1}{2}$ ounce of vaseline. Brisbane's Death to Lice, mixed with vaseline, will, as a rule, prove itself both the most effective and the most harmless of all the remedies mentioned, and its cost is insignificant—25 cents per pound package. A remedy which in extreme cases may be used as a last resort is made by dissolving 10 grains of corrosive sublimate in an ounce of water. This is very poisonous and therefore very dangerous to use.

Of all the remedies here mentioned, Brisbane's Death to Lice will, in the majority of cases, be found the safest and most speedy and efficacious. If taken in time it will overcome the trouble in a few days, but in case a number of birds have become affected, and especially if the feathered parts of the body have become infested, it must be applied regularly and patiently in accordance with the printed directions in order to successfully combat and overcome the disease. It is also necessary to adopt sanitary regulations. The affected birds should be separated from the well ones, and the house and runs disinfected with lime wash and carbolic acid solution. Cleanliness, fresh air, and fresh, pure drinking water are essential here as elsewhere.

**Chicken Pox,
Sore Head,
Pigeon Pox.**

An old poultry disease, known for many years in both the Old and the New World. Some people have called the disease warts; others have thought it to be a form of variola, allied to the common cow pox, if not the same malady. Careful study, however, has demonstrated it to be an entirely separate disease.

The most commonly used technical name for it is cutaneous psorospermosis. Chicken pox affects ordinary fowls, turkeys, pigeons, and, more rarely, geese. Pigeons and young chickens are most often affected, but old fowls are not exempt. This widespread disease is of southern origin, most often found in southern Europe and the Gulf Section of the United States. It is very destructive.

Symptoms.—Head of poultry chiefly affected, disease appearing as eruptions of round, oblong, yellow nodules, varying from the size of a pin head to that of a pea or grain of corn. The largest are found about the beak, the nostrils, the eyelids and upon the parts of the head that are free from feathers. They form rough, yellow masses upon the comb and wattles. The trouble may either confine itself to the spot where it first appears or may extend to the feathered portions of the body.

Causes.—This disease is contagious, spreading from one bird to another. Roosting places become speedily infected by one or more affected birds and the trouble is rapidly communicated to others. It appears that, while an abrasion of the surface of the skin or a deeper wound facilitates the entrance of the contagion into the tissues, the parasite also at times is able to penetrate the normal skin. Some have supposed that the bites of fleas and mosquitoes, or that the punctures of ticks produce the disease. Undoubtedly these act simply as a means for an easy entrance of the germs. Some moisture is necessary for the growth of the germs, those houses which have leaky roofs or into which water can penetrate through the walls favoring the contagion and spread of the disease. The fungi appear to multiply outside the birds' bodies, likely in the accumulations of excrement which exist in many poultry houses. Fungi are most numerous in the atmosphere during wet weather, while bacteria are most numerous during dry times. This fact may explain the prevalence of sore head during wet weather. Late hatched chickens are especially susceptible.

Treatment.—Brisbaine's Death to Lice made into an ointment is a very effective remedy for this trouble. It materially assists in the destroying of the parasite. Some people have been successful in feeding sulphur, and at the same time applying sulphur ointment twice a day to the nodules. Others have cured the affected birds by using Phenalin ointment, or glycerine containing 2 per cent of carbolic acid. Still another treatment is to bathe the affected parts with soap and water, in order to soften the crusts, and afterward to apply a solution of sulphate of copper (bluestone), 1 dram to $\frac{1}{2}$ pint of water. Sulphate of copper has been found destructive to many kinds of fungi. Brisbaine's Death to Lice, mixed with vaseline, however, we believe will easily be found superior to any of the other remedies mentioned, and it is well always to have it on hand.

Tincture of iodine is also recommended, both alone and mixed with 10 per cent of carbolic acid. This remedy, however, is rather severe and should only be applied sparingly and after everything else has proved ineffective.

The direct treatment should also in this instance always be accompanied with scrupulous cleansing and disinfection of the houses and, if possible, changing to new, uninfected runs. It is well to wash the feeding troughs and drinking vessels daily with boiling water. Isolate the affected birds at once when the disease is discovered, treat them apart from the others and disinfect the premises thoroughly.



SOME DISEASES OF THE FEET AND LEGS,

WHICH ARE COMMONLY MET WITH IN POULTRY AND BIRDS.

Prominent Among this Class of Diseases are Leg Weakness, Rheumatism and Gout, Superficial Sores, Corns, Deep Bruises and Abscesses, Scabies of the Legs and Feet, Scaly Legs.

Leg Weakness. A term popularly used to designate any condition in which birds find it difficult or impossible to support themselves upon their legs. It may originate in young chickens kept in brooders through which the heat is not properly distributed or where there is too much bottom heat; also in those which are kept constantly upon wooden floors. It is often encountered in heavy cockerels, also in flocks which have been forced or are kept in damp or ill ventilated places. The ailment generally may be specified as being of a rheumatic nature, and affects the muscles, tendons and joints. Often it is limited to bruises of the feet, and in some instances its origin and nature is obscure and hard to comprehend.

Symptoms.—Trouble may appear suddenly or gradually. In the first instance it is indicated by unsteadiness in walk and lameness, which may aggravate until the bird instead of standing upon its feet sits down upon its legs even when eating. In the worst cases birds are wholly unable to rise.

Treatment.—The birds should first be examined for bruised feet or inflammation of the joints, and if either of these conditions is found use Davis Veterinary Liniment, a standard remedy for the speedy relief and cure of this class of diseases. It is put up in bottles, ready for use, and the price—\$1.00 per bottle—is insignificant when the excellent results are taken into consideration. Full directions go with each bottle. In all cases in connection with the liniment give cooling feeds, such as bran, barley, rice, green feed, skim milk (or buttermilk), and vegetables, to which Davis Poultry Food has been added. Give 5 grains of bicarbonate of soda daily in the drinking water for grown fowls. See that the heat is properly applied in the brooders and that the birds have dry quarters with plenty of fresh air. Do not use any other condiment than those contained in Davis Poultry Food.

Rheumatism and Gout. Diseases to which all fowls are subject. Spasmodic jerking of the legs, followed by lameness, indisposition to remain standing, painful joints and refusal to walk, are the usual symptoms. The feet and the next joint above are most frequently affected. Then small swellings appear upon the sides of these joints, at first soft and somewhat painful, but gradually becoming more firm until feeling like enlargements of the bone itself. The swellings sometimes ulcerate, the sores appearing red, irregular in outline, and bleeding. Yellow, stringy pus partly fills the sore, and when this is removed the naked tendons, bones or joints may be seen. The cavities of the joints are opened to the air, fistulas develop and death of the bone occurs. The disease is chronic in its development, for the reason of which the advanced stages are generally seen in old birds. It is a lingering disease and the fowls affected may live a long time, even when affected to such an extent as described above. Gradually, however, they lose flesh, the plumage becomes rough and dull, and general exhaustion is followed by death.

Treatment.—Proper ventilation and drainage are especially important, as rheumatism is usually the result of exposure to cold and dampness. Buildings and roosts should be thoroughly dry, free from drafts, yet well ventilated and not too cold. Prevention through proper sanitary measures, here as always, is better than any amount of cure. If, however, the disease has gained entrance, the affected birds should be treated locally with applications of Davis Veterinary Liniment, as per the directions

given on the bottle, and in addition to this a frequent change in their ration should be made, with plenty of green feed. In combination with this an internal treatment, beginning with a dose of Epsom salts, 20 to 30 grains, may be tried with good results. Next day add 30 to 40 grains of bicarbonate of soda (baking soda) to the quart of drinking water, and give 2 or 3 grains of salicylic acid twice a day. Davis Poultry Food in proportion of 1 tablespoonful to each ten fowls should be added to the regular daily ration in order to stimulate the appetite and increase the digestive and assimilative processes. The very seriously affected birds had better be killed than treated, and the owner should always remember that without securing proper sanitary arrangements in the form of dry, clean and well aired quarters for his poultry, treatment at its best will not be able to cope with the evil.

Diseases of the Feet.

Cuts, bruises, pricks and similar injuries cause frequent injury to the feet of poultry. Fowls are peculiarly liable to this form of injuries because their nights are usually spent upon perches, in flying from which they often alight very heavily, causing sprains and injuries to the feet, while their vigorous scratching in search of feed is another reason. For the present purpose it is enough to divide the diseases of the feet resulting from injuries into three classes, viz., 1, deep bruises and abscesses; 2, corns; 3, superficial sores.

Deep Bruises and Abscesses. (Bumblefoot.)

An aggravation of corns resulting from prolonged irritation and bruising. Affected part is hot, painful, more or less swollen. An abscess sometimes forms, which in older cases may break and leave a suppurating sore. Joints are inflamed in severe cases, even to the extent of being penetrated by the pus channels which the abscesses have formed.

Treatment.—Three standard remedies for this kind of trouble are Davis Veterinary Liniment, already mentioned, Davis Carbolic Salve, and Davis Healing Powder. Preferably use the liniment, and in addition to this twice a day for half an hour soak the feet in warm water. Before using Davis Veterinary Liniment, poultice until the inflammation has subsided. If an abscess in the sole is indicated it should be opened with a sharp knife. If Davis Veterinary Liniment or the two other Davis Preparations mentioned are not at hand apply a boric acid ointment after the poulticing is finished and protect the feet with a piece of cotton cloth. The last measure should be employed also with the Davis Preparations. If the joints have become affected, especially if they communicate with the pus channels and are the seat of the suppuration, the bird had better be killed, as treatment in this instance in many cases is ineffective and recovery often impossible. By prompt treatment with Davis Veterinary Liniment and the several curative measures recommended in connection therewith you will, however, be able to save your flock.

Corns.

The just described trouble in modified form. An inflammation and thickening of the skin on the under surface of the foot, resulting from prolonged irritation, pressure and bruises. Too small or narrow perches are most generally the cause, as they compel the fowls to grasp them tightly in order to keep their balance. Heavy birds flying from perches and alighting upon stony surfaces or hard floors are also liable to become affected.

Treatment.—Prevention by providing against the conditions mentioned is the most effective treatment. Perches should be broad and flat, of proper height, and the floor upon which the birds alight should be covered with earth or sand so the feet will not be bruised. The affected birds should be treated by paring off the thickened epidermis, without causing bleeding, and applying Davis Veterinary Liniment. In the absence of this the affected part may be painted with tincture of iodine.

Superficial Sores, Including Abrasions, Pricks, Cuts and Fissures.

Although injuries of this kind as a rule are not serious, still, if the bird is lame with heat or swelling about the toes or foot, measures should be taken to make it comfortable and prevent more dangerous conditions to develop.

Treatment.—In case of much inflammation with heat and swelling, hold the foot in warm water (as warm as the hand can bear) for half an hour, adding hot water from time to time to keep up the temperature. Then apply Davis Veterinary Liniment to the injured parts in accordance with the directions on the bottle. This liniment should also be applied to abrasions, cuts and cracks, where the hot water treatment is unnecessary,

as it will insure rapid healing. Also confine the bird to a yard covered with soft earth or young grass for a few days and do not let it roost upon a perch until its feet have healed.

**Scabies of the
Legs and Feet.
Scaly Legs.**

Symptoms.—Epidermic scales on the anterior surface of the legs and upon the upper surface of the foot become loosened and elevated by the formation of a whitish crust beneath them. The raising of the scales gives the legs a rough and enlarged appearance. Disease begins between the toes, running a very slow course. It gradually extends up the leg and along the toes until the whole shank and foot become involved. Both legs are usually affected at the same time and to about the same extent. If treatment is not resorted to the epidermic scales are detached and the fowl walks with difficulty. In severe cases a joint or even an entire toe may become detached, the birds lose flesh and die from exhaustion.

Causes.—A form of scabies or mange caused by the mite known technically as the *Sarcoptes mutans*. Contagious, although not spreading rapidly. Asiatic breeds are most susceptible. It attacks fowls, turkeys, pheasants, partridges and cage birds, but has not been seen in ducks or geese. In the production of scaly legs this mite penetrates beneath the epidermic scales on the upper surface of the foot and the front of the shank. By burrowing, an irritation is set up leading to an exudation of serum. If the crusts are removed and the under surface examined with a lens they are found to contain a large number of depressions, in each of which a female egg containing *Sarcoptes* is lodged. The larva, males and younger females are found wandering beneath the crust.

Treatment.—Adopt prompt and energetic measures to eradicate it as soon as observed in a flock. Isolate the affected birds, and thoroughly clean the houses that contained them. Scald roosts and woodwork with boiling water, or cover them with phenalated whitewash. The treatment is the same as with scabies of the body, except that the loosened scales must be removed in order to bring the remedy in contact with the mites. To accomplish this soak the legs for a sufficient time in warm water to which soap has been added. When thoroughly softened the loose scales may be removed without causing bleeding. Another way is to apply a coating of soft soap to the affected parts, leaving it to act for from twelve to twenty-four hours. Then place the legs in warm water, soften the scales and remove by gentle rubbing and friction. Then dry and treat the legs by applying Davis Veterinary Carbolic Salve to the affected parts as per the instructions given with the bottle. If this is not at hand, use carbolic ointment (1 to 10), or balsam of Peru. Davis Veterinary Carbolic Salve will be found very prompt and efficacious in its action, and the disease is not difficult to cure if it is used, and at the same time the preliminary treatment is careful, the loose scales and crusts all being removed



CONTAGIOUS DISEASES WHICH ARE APT TO AFFECT DIFFERENT SETS OF ORGANS.

Among the More Prominent of Such are Tuberculosis, Infectious Leukamia, and Fowl Cholera.

Tuberculosis in birds is frequently mentioned in medical literature. An eminent French veterinarian says: "Tuberculosis is a frequent disease with birds of the poultry yard. It occurs with them in an epidemic form. It attacks fowls, pheasants, pigeons, turkeys, peacocks, guinea fowls, etc., and it may even be produced in small birds experimentally." Many cases of the disease have been reported as the result of autopsies of fowls in Germany, but comparatively few in the United States.

Symptoms.—As the symptoms of tuberculosis in birds are synonymous with those common to other diseases, it is not quite possible to accurately determine the presence of the plague by diagnosis. There is rapid and progressive emaciation, evidenced by the loss of weight, wasting of the muscles and prominence of the bones. Comb becomes pale, bird grows languid, dull and sleepy by degrees. In the latter stages a persistent diarrhea appears, increasing in intensity until exhaustion causes the death of the victim.

The symptoms indicated are those observed when the trouble is confined to the internal organs. It, however, also often affects the joints and bones, causing lameness, swellings of the joints and deformities of the bones. Ulcers also may form containing bacilli. The skin and external mucous membranes are often affected in parrots, but rarely in other birds.

Causes.—Like the tuberculosis in the human, the disease in birds is caused by a bacillus. It resembles that of man, but is larger, more vigorous and hardy, and grows better outside the body. It is a very contagious disease and usually appears in a flock as a consequence of bringing in new birds. In other words, it results from contagion carried by birds from other diseased flocks. Many outbreaks also have been attributed to infection from eating the sputum of persons affected with consumption. Some authorities admit the plausibility of this while other deny it. Certain it is, however, that poultry and pigeons experimentally are not easily infected with the tuberculosis of people, cattle and other animals which are classed together as mammals. Although it may sometimes be accomplished, it is equally difficult to transmit the disease from one bird infected in this way to others. Hence the danger to birds from human virus is not great. On the other hand, the bird or avian tuberculosis spreads rapidly from bird to bird, and is easily transmitted experimentally to birds, but has little effect upon most mammals which are very susceptible to human tuberculosis. Consequently, all symptoms and experiments demonstrate the fact that there is a wide difference between avian and mammalian tuberculosis. Still, as has been stated, the disease in rare instances may be transmitted from one to the other of these species. The tuberculosis in birds and mammals are, in fact, two varieties of the same malady, the bacilli of which through a long series of years of separation have grown apart. A very interesting fact is that parrots are usually affected with the mammalian form of tuberculosis. It has been shown by experiments that it is very difficult to infect fowls and pigeons by inoculation, but rabbits, guinea pigs and dogs readily contract the disease by such inoculation. From the various facts recorded it is concluded that the tuberculosis in parrots is identical with tuberculosis or consumption in man; that parrots are infected from diseased people, and may in turn affect other people. The germs of the disease are found in enormous numbers in the discharge from the ulcers, in the secretions of the nasal passages, and often in the excrement. The cages are soiled with these different excretions, which soon become dry, are reduced to dust, and then disseminated through the air of the apartment by the flapping of the wings of the bird. Man in breathing this atmosphere takes the germs into his lungs, and in this way becomes infected. On

the other hand, as poultry and pigeons do not readily contract tuberculosis from persons, it seems reasonably certain that mankind is in no great danger of becoming infected from these birds. It is well to take reasonable precautions, however.

Diagnosis.—It is well to have the exact nature of the disease confirmed by an expert. A microscopical analysis, showing the presence of the bacillus tuberculosis, is the most reliable and satisfactory evidence.

Treatment.—There is no cure. Eradication of tuberculosis in birds from an infected premises can only be attempted with a fair prospect of success when all the birds are killed. Ulceration of the intestines is likely to exist in any individual preserved, and thus the bacilli are constantly distributed anew. There should, therefore, be no attempt to save any birds from an infected flock. Kill the birds and dispose of them either by burning or deeply burying. Carefully disinfect the premises. Sweep and scrape every bit of the manure together and saturate it with a 5 per cent solution of Phenalin or mix it with lime. Wash the floors and woodwork with boiling water or with a hot solution of carbolic acid or a 2 per cent solution of Phenalin. Feeding troughs, drinking vessels and nests should be treated in the same manner. All yards used for penning birds should be sprinkled with the carbolic acid solution. After the cleansing and disinfection open the premises to the sun and air for a month, if possible, before introducing new birds. It is then advisable to cover the walls and roosts with whitewash to which has been added 2 ounces of Phenalin or 4 ounces of crude carbolic acid to the gallon of water, and ventilate a few days longer before the houses are used. If you scrupulously enforce these measures you may be reasonably certain that the contagion will be destroyed and that the new flock may be safely introduced.

Infectious Leukamia.

A disease of the blood quite common among fowls. The blood is light colored or pale, owing to a considerable decrease in the number of red corpuscles and an increase in the number of white corpuscles or leucocytes. The disease frequently has been mistaken for fowl cholera, and has been observed in Rhode Island, Maryland, District of Columbia, and Virginia. Fatal outbreaks of this disease have been observed in large brooder houses among incubator chickens from one to three weeks old.

Symptoms.—Considerable elevation of temperature, reaching three degrees or more above normal. Drowsiness; general debility; paleness of the mucous membranes and of the comb, wattles and skin about the head. The fever is of a continuous type, usually resulting in death from four to five days. In some cases the duration of the disease is longer, and two or three weeks may elapse before the death of the bird. Excessive emaciation is then present. A microscopical examination of the blood shows a marked diminution in the number of red corpuscles and an increase in the number of white ones.

Causes.—The disease is infectious and caused by a micro-organism technically named *Bacterium sanguinarium*. It is a non-motile, rod shaped organism, which is found in the tissues of the fowl. The disease in natural outbreaks probably is taken into the body with the feed. If good, sanitary conditions are observed it does not spread very rapidly. In experiments where healthy fowls were placed in cages with diseased ones they did not in a single instance contract the disease. When cultures of the germs and diseased viscera were fed, only about one-half of the fowls became affected. In spite of this the mortality in some instances has been great, demonstrating that the destructiveness of the disease under conditions favorable to its propagation is great. But the germ is not a very virulent one, and, as mentioned before, the outbreaks appear to occur where the requirements of ordinary hygiene are not strictly complied with. This malady therefore may be looked upon more than anything else as a filth disease, and, as the germ in some respects resembles the common intestinal germ known as *Bacillus coli communis*, it is not improbable that outbreaks may occur from filth without the necessity of importing the contagion upon the premises.

Treatment.—Prevention of filth diseases is much easier than their cure, and this malady is no exception to the rule. Cleanliness, good feed, pure water and ventilation are conditions antagonistic to the propagation of infectious leukamia. Davis Poultry Food, increasing as it does the assimilative and digestive powers of the fowls, insuring a healthy, normal circulation, free from obstructions of any kind in the way of accumulations of filth and impurities in the alimentary canal, will do good work in helping to prevent and insure against this form of disease. When this disease appears the poultry

houses should be cleansed and whitewashed. The floors should be sprinkled with Phenalin—one of the remedies contained in the Davis list of standard preparations; or, if this is not at hand, use carbolic acid in a solution of 5 per cent strength. Other efficient disinfectants may be used if more convenient. The sick fowls must be removed and isolated. Quinine in the dose of 1 to 2 grains may also be used for the sick fowls with good results. Sulphate of iron (copperas) in the drinking water is thought to be a good prophylactic remedy. Probably any stimulating and tonic treatment will prove beneficial after proper sanitary surroundings are secured. Davis Poultry Food, as indicated, may be used with excellent results.

By experiment it has been demonstrated that the germ in this disease is killed in five minutes by a 1 per cent solution of Phenalin, and in ten minutes by lime water. Sulphur fumes were also effectual by three hours' treatment. It may also be destroyed by 136.4 degrees Fahrenheit, and, consequently, scalding water may be used to cleanse drinking and feeding troughs and other infected utensils. The disease seems to be one of the most common to which fowls are subject, and there ought therefore to be plenty of opportunity for making experiments to determine what kind of treatment will prove most effective in any particular locality.

Fowl Cholera. A contagious disease of birds caused by bacteria, transmitted by cohabitation and inoculation. Symptoms are high fever, great weakness and prostration; and the attack usually results in the death of the fowl. It is a common poultry disease all over the world, and is mentioned in some of the oldest works treating of the diseases of animals.

General Characteristics.—All varieties of domesticated poultry, chickens, ducks, geese, pigeons, turkeys, and also caged birds, such as parrots and canaries, are subject to the attacks. Even some species of wild birds are affected by the disease.

As a rule the infection occurs by taking feed or drink contaminated with the excrement of sick birds. Birds may also be infected through wounds of the skin or by inhalation of the germs in the form of dust suspended in the air. Germs may be taken into their bodies by consuming particles of flesh and blood from the carcasses of affected birds that have died or been killed. The disease, as a rule, is introduced upon a farm or in a locality with new birds purchased for improving the stock, or with eggs for hatching. Wild animals or wild birds may disseminate it when it exists in a district. It is communicable by inoculation to rabbits and mice. Guinea pigs are not very susceptible to it; the young animals may die but the adult ones usually have nothing more than an abscess where the inoculation has taken place.

Symptoms.—The sick birds generally stop eating, or the appetite is very much impaired, although there are instances where they continue to eat almost till the time of death. The earliest indication of the disease is a yellowish discoloration of the urates, or that part of the excrement which is excreted by the kidneys. In health this is a pure white, though it is frequently tinted with yellow as a result of other disorders than cholera. This yellowish color of the urates therefore is not an absolutely certain proof, but is a valuable indication when the disease has appeared in a flock and an effort is being made to check its course by isolating birds as promptly as possible after the infection has taken place. In some few cases the original symptom is a diarrhea in which the excrement is passed in large quantities, consisting almost entirely of white urates mixed with colorless mucus. Generally the diarrhea is a prominent symptom. The excrement is voided frequently and consists largely of urates suspended in a thin, transparent, sometimes frothy mucus. The urates are of a deep yellow color, which in the more advanced stages of the disease may change to greenish or even a deep green. Soon after these first symptoms appear the bird separates itself from the flock, it no longer keeps itself erect, the feathers are roughened or stand on end, the wings droop, the head is drawn down toward the body, and the general outline of the bird becomes spherical or ball shaped. Great weakness now sets in; the bird becomes drowsy and may sink into a sleep lasting throughout the last day or two of its life. It is difficult, if not impossible, to arouse it from this.

These are some of the most prominent symptoms indicating this dangerous and destructive disease. It may be added that the affected birds rapidly lose in weight; they become so weak that a slight touch causes them to fall over, and they walk with great difficulty. Death may occur without

a struggle of any kind or there may be convulsive movements and cries. The disease may rapidly run through a flock, destroying the greater part of the birds in a week; it may also assume a more chronic form, extend slowly, and remain upon the premises for several weeks or months.

Treatment.—For the treatment and cure of chicken cholera there is no better remedy in the world than Dr. Fillmore's Chickolin, and Davis Poultry Food. In order to be of benefit and bring about a cure, it must, however, be used in the first stages of the malady, before it has gained any considerable headway. No remedy will be of very much benefit after the disease has been allowed to spread throughout the poultry yard. We recommend Dr. Fillmore's remedy because, after exhaustive tests, it has been found to be superior to all the other preparations on the market. Tests in our laboratories and practical tests by many of the country's foremost poultry breeders have demonstrated its value as a curative agent par excellence in that most difficult and fatal of all diseases that attack fowls—chicken cholera. Should you, however, not have this preparation at hand, you may try sulphur, copperas, capsicum, alum and resin, given either alone or mixed together. These remedies may have either a stimulating or astringent effect, or both, depending upon the combination used, but Davis Poultry Food gives best results. A solution made by diluting one dram of carbolic acid or hydrochloric acid, with one quart of water has also been recommended. This should be given adult birds in the dose of a dessertspoonful.

Stringent sanitary precautions, it will be understood, are the proper manner to prevent and combat cholera. You should remember that it is a contagious disease and that it is nurtured on germs which in some manner are brought upon the premises from some other place where the disease exists. Newly purchased birds, eggs, wild birds, and other animals, may introduce the disease on a farm. By all means guard against the introduction of contagion into your flock. Isolate and quarantine newly purchased birds for two weeks before they are mingled with your flock. If you hatch eggs from other yards keep the nest and the young birds isolated until you are sure that they are healthy, keeping the chicks apart and watching them carefully for the first ten days.

Dogs and other animals should be kept out of the poultry yard if possible. Birds which have been exhibited at shows should be quarantined for ten days after their return. If in spite of all precautionary measures the disease should appear, isolate, disinfect, and always have a supply of Dr. Fillmore's Chickolin at hand, so that you may be prepared to treat the patients at once and nip the disease in the bud. The remedy is inexpensive, its price being only 50 cents a package, with full directions for its use. It is also very highly recommended for gapes. In isolating infected birds you need not try to secure a very wide separation. Ten feet is sufficient distance to prevent the communication of contagion from cholera, if it be not in some way carried from pen to pen by attendants or animals. The atmosphere does not carry it to any appreciable distance.

Disinfection. For efficient and thorough disinfection there is no better remedy than Phenalin. Always have a quantity of this inexpensive, harmless and extremely effective and efficient purifier and deodorizer at hand; use it for spraying the floors, roosts, cracks and walls of your poultry house, carefully following the directions given on the package, and you will be more than pleased with the results. Should you, however, not have it on hand, try a solution made by mixing 1 pound of carbolic acid with 24 pounds, or 12 quarts, of hot water. Or 1 pound of sulphuric acid to 50 quarts of water may be used. The latter is the cheaper but is more dangerous. Phenalin should be given the preference over either of these two, as it is far safer and more reliable, and does not cost any more. Sulphuric acid is dangerous to use, and in preparing the solution, when this agent is used, you must be very careful that it does not splash into your eyes, burn your hands or clothes by contact. If possible move the birds into new runs and new houses when the scourge appears among them. Before moving separate all which seem to be sick and put these by themselves. Thereafter saturate the floor of the old house and all of the manure about it with the disinfectant chosen. In applying it you may use a watering can, just as you use for watering flower beds or gardens. Confine the healthy birds of the flock to a small run, and, if possible, disinfect the poultry house by sprinkling at least once a day. Sweep up, disinfect and remove the droppings every day. Have the building whitewashed. The disinfecting properties of this application may be enhanced by adding $\frac{1}{4}$ pound of carbolic acid to each gallon of lime.

How to Eradicate Cholera.

Watch your flock carefully, and if any bird shows signs of disease remove it at once. If you are careful in this way you may arrest an outbreak of fowl cholera in a very short time. Use Dr. Fillmore's Chickolin promptly upon discovering the first signs of the trouble. Persevere with these precautionary measures for two or three weeks, and if in the course of that time no more birds become sick the danger may be considered passed. The difficulty in arresting outbreaks in fowls usually is that the birds are being allowed to roam over too wide a range. When at last the disease is recognized, the contagion is widely scattered through the droppings of the affected birds. It is impossible to disinfect a large range, and the birds will pick up the infection one after another when roaming about at will. If you desire to kill sick birds in order to get rid of the contagion as quickly as possible, dig a deep hole, put the birds therein and kill them there, so that their bodies and blood may both be buried. The blood is very virulent, and if remaining on the surface may be the cause of another outbreak of the cholera.

Vaccination

cannot be recommended as a preventive. Davis Poultry Food, aiding the digestive and assimilative powers, insuring perfect circulation, strengthening and invigorating the nervous and lymphatic systems, is the only agent in existence which is reasonably sure to prevent cholera and all the other maladies common among our domestic fowls. No thrifty, progressive, up to date poultry breeder or farmer can afford to be without it. It is the king among its fellows, the remedy par excellence, insuring abundant health and vitality to the domesticated feathered tribes that roam our yards and pastures, supplying eggs and meat for our table, and dollars for the farmer's pocket.

INJURIOUS HABITS AND VICICES.

Among Them are Egg Eating, Feather Eating and Feather Pulling.

Egg Eating.

This is one of the most costly and troublesome of the acquired habits of poultry. It begins generally by the accidental breaking of an egg in the nest, but spreads rapidly among the flock, until many of the eggs laid are purposely broken and eaten by the hens. Heavy birds are more liable to contract the habit, because they are more apt to break their eggs by stepping on them than lighter birds. When a hen breaks an egg she not alone eats its contents in the nest, but often carries large pieces of the shell about the house or yard, fighting with other birds, all eager to get a share. Thus is spread the knowledge of how appetizing are eggs and egg shells, and one bird becomes the teacher of another.

Whatever conditions contribute to the breaking of eggs in the nests naturally may be considered contributive to the contracting of the egg eating habit. Thin shells break most easily, and it is therefore obvious that a deficiency in the shell making constituents in the feed is a factor. Again, an egg may be broken for want of a proper quantity of straw in the nest to protect it from contact with stone or wood.

How to Prevent and Cure the Habit.

Davis Crushed Oyster Shells, Davis Crushed Clam Shells, and especially Davis Mico Spar Cubical Grit are all excellent shell producers, and by feeding any of these preparations to the hens you will insure a thick, strong shell upon the eggs, which they will not be able to break. Supply the nests with sufficient straw, and use artificial nest eggs. Have the straw in the nests preferably of a dark color, so that a broken egg may not attract the hen's attention. If the habit is acquired, however, it is well to have the nests reconstructed so that the eggs will roll beyond the reach of the hen when laid. You may also use artificial eggs about the nests and houses, permitting the hens to pick at them and get the idea that they are no longer able to break shells. Or blow out the contents of a few eggs through

a small hole in the ends of the shell, fill the space with a paste of mustard, capsicum, aloes, or other disagreeable compounds, and the hens in attacking them will get so nauseated that in the future they will leave all eggs severely alone. Remove confirmed egg eaters from the flock and, if not too valuable, kill them for table use.

Fowls may acquire the habit of extracting and eating their own feathers or pulling the feathers of other members of the yard. Spring and molting time favor contracting of this vice. Indications of its existence are loss of plumage, disheveling of the plumage, barrenness and redness of the skin over the back and on the upper thighs. On watching the birds you may discover them in the act of catching one or more feathers in their beaks, tearing them out and swallowing them. Young growing feathers having quills filled with blood seem to be delicacies.

Causes.—Improper rations; insufficient exercise; idleness; irritation of the skin caused by animal parasites. Anything contributing to the acquiring of an abnormal appetite may become a contributive factor in the contracting of this vice.

Preventive and Curative Measures.—Give the fowls a free run. Make them scratch for a large percentage of their feed. This aids their digestion and occupies their time. Very often the habit is due to insufficient animal matter in the ration, or to feeding too long on a single kind of grain. It is therefore important to properly balance the ration. Davis Meat Meal, Davis Meat or Beef Scraps and Davis Bone Meal or Coarse Ground Bone, fed into a varied ration of grain, vegetables, skim milk and green feed will speedily correct the evil. In order to insure the perfect digestion and assimilation of the birds, which may have become impaired by the vice, give the fowls Davis Poultry Food regularly, mixed in the feed ration. In order to speedily overcome the habit, try an application to the feathers of lard or vaseline, in which powdered aloes has been mixed. This has been found a very effective method. The bitter taste of the aloes probably is responsible for the good results attendant upon this treatment. If you vary your poultry feed as advised above, and supply the birds with a proper amount of animal matter in the ration by the use of the Davis Feeds recommended, you need hardly ever go to the trouble of applying this mixture, except in very aggravated cases. Examine the skin and feathers carefully for mites or lice, and if such are found apply the remedies recommended for parasites. In severe cases separate the most inveterate feather eaters from the remainder of the flock. Be sure always to feed plenty of grit, preferably Davis Mico Spar Cubical Grit. In order to be safe against indigestion and malassimilation feed Davis Poultry Food with the daily ration in the proportion recommended above.



DISEASES OF HORSES.

Glanders.

This disease is also called farcy, and exists in three forms: the chronic, acute, and latent. It is a serious affection, malignant and contagious in its character, and complicated with both local and constitutional symptoms.

Causes.—It is caused by a germ called bacillus of glanders, or, technically, bacillus mallei. It is ushered in by a state of exhaustion in the patient, the horse being underfed, overworked, or badly cared for in other respects. The bacillus is a tiny, rod shaped body, occupying about two-thirds of the diameter of the red blood corpuscles. Oxygen must be present if its life is to be sustained. It is unable to live through the process of boiling or freezing, and certain drugs, such as bichloride of mercury, 1-5,000, or a 1 per cent solution of Phenalin, will exterminate it. It generally makes its home in the lymphatic glands, rarely finding an outlet from the body in the milk or bile. It is a peculiar fact that some horses seem to be practically immune from the attacks of this germ, while it easily can be inoculated in certain members of the equine family, the ass being an exceptionally easy subject to infect. To guard against infection in the stable you should be very careful about the feeding pails, harness, bedding, currycombs, mangers and troughs; in short, every article which comes in contact with an animal suffering from this disease, as contagion is easily spread through such mediums.

Chronic Glanders.

This is in many cases an insidious malady, but is also often revealed by certain constitutional symptoms. In the last instance—which is the more common of the two—you will find upon inspection that your horse is affected with ulceration of the membrane of the nose. It will, at the start, appear in the form of small red spots. (Sometimes it may be a single spot at the outset, and sometimes there may be a number of them.) In a little while these spots swell, each forming what is called a pustule, and this upon breaking leaves an ulcer of the kind we usually call chancre. These ulcers generally continue to grow and spread over a larger and larger surface, also deepening, and at times perforating the septum. The organs known as the false nostrils supply a favorite residence for these sores. In looking for the disease you should also examine the glands between the lower jaws, which you as a rule will find swollen and peculiarly hard to the touch, not painful and adhering to the jaw bone. Suppuration rarely exists, although in some few cases the glands may be found to discharge a moderate quantity of a thin, oily fluid, which sticks to the fingers like glue. Also examine the discharge from the nostrils, and note its greenish yellow color; you will find it sticky as glue between the fingers, sometimes streaked with blood, but without odor, except when it is mixed with dead and decomposed substance. Often you will find it gluing itself to the outer part of the nostrils, when it should be carefully removed with a wash of Phenalin.

Symptoms.—The patient does not do well; its temperature runs high; it becomes emaciated; the coat is staring; appetite up and down; there is a marked perspiration, exhaustion, lameness, shifting from one leg to another; coughing; sneezing; sometimes with the discharge from the nose turning more and more bloody as the case progresses. The visible mucous membranes (of the eyes, mouth, nose, rectum, etc.) may take on a slate color, and swellings in various parts are present at times.

Latent Glanders.

If the patient suffers from this form of the disease, you will be unable to discover any external lesions, as there are none. The affection manifests itself, breaking out in ulcers on the bronchial mucous membrane, or the membrane of the larynx. The only outward symptoms you will find are a peculiar labored respiration, dullness and sluggishness, staring coat, etc. The temperature often runs high, and lameness in some parts may be present, with a dead feeling over the organs which suffer.

Acute Glanders.

In the acute form of the disease you will find the symptoms of the other forms present in a more pronounced and aggravated way. The bloody hemorrhage from the nose becomes conspicuous, and if this is absent the other discharge is heavy and constant. The affection progresses with great rapidity; spots and ulcers form on the membrane of the nose; you will find a pronounced swelling under the lower jaws, and when you press thereon the horse will show symptoms of pain; the temperature runs high, often as high as 103, 104, or 105 degrees Fahrenheit; respirations are rapid and labored; if you take the discharge from the nose between your fingers you will find it still more gluish and sticky; often it accumulates under the nostrils and particles of dust and other material will adhere to the mass. (In this case always carefully wash off the stuff with a solution of Phenalin and water.) The obstructions thus forming in and around the tubes of respiration, if not removed, may become so dense as to cause death by suffocation.

Farcy.

In this form of the affection, which is also known as cutaneous glanders, you will find swellings or nodules—the so called farcy buds or farcy buttons—covering the skin. Their size varies from that of a pea to a hickory nut, and as a rule you will find them on the inside of the thighs, all the way up to the base of the tail; on the back part of the hock; on the sides of the neck and shoulders; on the part of the sides of the horse where rests the saddle; on the chest; under the abdomen, and all over the head and face. If the case is acute these swellings in the course of a week or so break open and discharge a greenish yellow matter of oily and sticky consistency, while in chronic cases this symptom is absent, the swellings being hard to the touch, with no attendant pain.

How to Diagnose Glanders.

If you have paid careful attention to the various symptoms described you should be able to make a pretty correct diagnosis yourself. Keep in mind when you examine the horse the swellings, ulcers, the sticky, oily discharges from the nostrils and sores, the high temperature, the exhausted and emaciated condition. You may, however, mistake nasal catarrh for glanders if you do not make a thorough examination. The disease is serious and calls for prompt treatment.

Treatment.—Separate the patient or patients, watch them carefully and note how the various symptoms develop. Administer a good aloetic purge; water the diseased animals from separate pails, and be very careful that no articles, such as blankets, harness, bedding, etc., that come into contact with them are afterward brought into contact with the healthy horses. You must scald the stalls with washing soda, $1\frac{1}{2}$ pounds to a pail of boiling water, using as big a quantity as is necessary. Afterward you should apply a wash consisting of a 2 per cent solution of Phenalin, or bichloride of mercury, disinfecting the stables regularly every month or two with sulphurous acid gas or chlorine, while the Phenalin wash may be applied as often as desired with good results. If you are not positive as to the nature of the disease, better have a veterinarian make a test with mallein, injecting $2\frac{1}{2}$ c.c. into the side of the patient's neck. The veterinarian will take the temperature before the injection, and then continue to take it every two hours for at least fourteen hours after, going as far as twenty-four hours in aggravated cases. Then, if the horse suffers from glanders, the temperature will have risen 2 or more degrees, and there will be a local swelling at the spot where he introduced the mallein, which is painful to the animal when pressed upon.

For the prevention of this disease Davis Stock Food, used according to directions, will be found to be of the greatest possible value, stimulating as it does the digestive organs, aiding the assimilation and perfecting the circulation. If this preparation is used with the regular daily feed ration, it will practically insure the animals against contracting glanders.

**Maladie
du Coit,**

also known as equine syphilis or disease of the coitus, is a contagious, venereal disease, often chronic, accompanied with discharge from the generative organs, ulceration, and sometimes paralysis.

Causes.—The fundamental cause apparently is the same phenomenon which underlies venereal diseases of all animals. It occurs after copulation, and the contagion springs from certain conditons of the urethra of the male and the vagina of the female. It may take six or eight weeks from the time the infection took place before the disease becomes evident.

Symptoms in the Female.—If you examine the mare, you will find that some three or four weeks after copulation there will be a discharge from the vulva or entrance to the vaginal tract. At the start it is transparent, but in a little while its color changes to opaque and yellow. Then there will be a swelling of the procreative organs, you will find the vaginal membrane folded over itself and covered with a thick, jelly like fluid. In some cases there may also be erosions and reddish spots on the gland. There is an inflamed condition of the clitoris, which often causes the mare to stretch herself and eject small quantities of urine. As the disease progresses you will notice the lips of the vulva opening, clearly showing the erected clitoris, and she will nervously switch her tail from side to side. Large swellings may break out on the legs and body, shifting position, disappearing, as it were, only to reappear shortly afterward in other spots. The mare will commence to drag her toes, cross her legs, and rock her body to and fro, and a serious condition of paralysis of the posterior extremities may ensue, a symptom which is often progressive in character, and going so far as to paralyze the muscles of the face, eyelids and lips. The ears of the animal will droop, she lies down and is at length unable to rise, she contracts bed sores, and, if you do not destroy her at this period, she will shortly succumb of herself to exhaustion and general debility. The case cited is of course an extreme one.

Symptoms in the Stallion.—In the stallion it will not be so easy for you to discover the early symptoms. The same form of discharge as in the female is there all right, but the quantity is less, and the attendant swellings of the meatus and reddish spots over the sheath are often overlooked by all but the experienced eye. However, you will soon be able to make sure of the presence of the malady by the paralysis which occurs in the hind parts, and the symptoms of pneumonia which are often present before the end. If you examine the body of the patient after death you will find a general condition of emaciation and debility present in the affected organs and tissues. Swellings, thickenings and exudations between the muscles and glands of the organs, attended by sticky, jelly like matter, also often are present. In advanced cases the nerves are degenerated, and the brain and spinal cord visibly congested and diseased. You should look upon this as a very serious disease, which is irregular and often chronic in its tendency, and which may cover a period of months or years—often running all the way from eight months to three years. The stallion is the greater sufferer, and, as he may spread the disease to all your mares, you should be very careful in your examination of the stallion which is to serve them, remembering that no less than 70 per cent of the affected animals succumb to the disease.

Treatment.—Local treatment seems about the only one of any service. You should resort to stringent and disinfecting lotions; as, for instance, bichloride of mercury, 1-10,000; potassium permanganate, 1-100; silver nitrate, 1-100; sulphate of zinc, 1 grain to the ounce. Or in Phenalin, 1 ounce to $\frac{1}{2}$ gallon of water, you will find a very excellent antiseptic. Stimulating liniment, such as Davis Veterinary Liniment, applied to the loins and surrounding parts, is also recommended. Some veterinarians advocate castration of the stallion and even spaying of the mare, but it seems both severe and useless, and, if the disease is of the acute kind, the remedy ordered by a number of European governments, namely, destruction of the stallion, seems the only effective one, and the only rational means of insuring your mares against the destructive contagion.

Meanwhile it should not be forgotten that in all milder cases Davis Stock Food, aiding nature as it does in throwing out impurities and diseased tissue from the body, bringing about a powerful circulation of the blood to all parts, and centering especially about the parts affected, may be of the greatest assistance in overcoming the malady and saving valuable animals. Internally at the same time such remedies

as belladonna, strychnine, potassium iodide, or Fowler's solution of arsenic, should be administered by a skillful veterinary surgeon.

Equine Rabies, also called Madness, or Equine Madness, is a dangerous disease, acute and violent in its tendencies, very contagious, and emphasized by a strain of functional disorders. Rabies, as is well known, is a disease which may be transmitted to man and all animals by inoculation, and is characterized by the peculiar reflex and nervous symptoms which follow in its wake. Plainly speaking, it is a dread of water, due to functional disorder, it being impossible for the patient to swallow the water on account of paralysis of the muscles about the throat. In the horse a period of from two to eight weeks lapses from the time of infection until the outbreak of the disease.

Symptoms.—If your horse has become infected with rabies, you will, at the expiration of the incubation period, find him nervous, very excitable, and gradually growing violent and wild. He will kick and bite everything around him, and you should exercise the greatest care in attending to him, lest his teeth with their poisonous saliva come into contact with you. He will tremble, neigh, rub his body against the side of the stall, gnawing everything in sight, and often fracturing his own jaw in his mad antics. He loses his appetite; the pharynx and posterior parts will gradually become paralyzed; then ensue convulsions followed by coma, and he dies in the course of a week.

Treatment.—First of all you should thoroughly cauterize the wounds with acids, caustics or red hot iron. This should be done, if possible, immediately after the inoculation, or as soon as you suspect that he has been infected. Then treat antiseptically, using 1 ounce of Phenalin to $\frac{1}{2}$ gallon of water for the wash, washing out the wound thoroughly every day until the danger period is past. The Pasteur treatment is excellent in the horse, as elsewhere, and you should have a veterinarian administer it to the patient, inoculating a specially prepared vaccine into his veins which will counteract the poison of rabies.

Dysentery. This disease is popularly known as the bloody flux, and may be defined as an inflammation of the large intestines, developing malignant ulceration, causing frequent stools, and attended often with colicky pains of a severe nature.

Causes.—You will find that if you are in the habit of keeping your horses in damp stables, which are ill ventilated, and perhaps located near swampy or marshy meadows, or where decaying animal or vegetable matters poison the verdure and air, or where the animals are compelled to resort to the drinking of impure, stagnant water, there will always be some among them suffering from this form of disease. Other causes, such as sudden chillings, drinking when hot and perspiring, indigestion, caused by the partaking of unwholesome, improper feed, etc., may produce it. It may be of interest for you to know that in man dysentery is counted among the four greatest epidemics of the world, and whole regiments of an army have been known to be attacked by it.

Symptoms.—You will notice symptoms akin to those of dyspepsia at the outset; the patient will look dull and exhausted; he will stand with his feet drawn together under him, back usually arched, manner listless; there are diarrheal discharges; there is excessive thirst, and often the belly is swollen and tender to the touch. As the disease progresses you will find the feces turning liquid, containing blood stained mucus of fibrous character, with shreds of mucous membrane, the discharges being of a peculiar fetid, offensive odor. The patient will soon commence to lose flesh, spirits droop more and more, and complete emaciation and general exhaustion and debility precede death. The affection is popularly known as bloody flux on account of the bloody nature of the evacuations in the latter stages, and because at this point the discharges become involuntary, the animal losing control of the function completely. The milder cases may recover, but there is little hope for the cases upon which ulceration and bloody discharges attend. Ten days to four weeks is the usual period elapsing from the inception to the termination of the attack.

Treatment.—You should lose no time in calling in a competent veterinary surgeon. Now try to get rid of the irritating, poisonous substances in the bowels by a purge of linseed oil. Let the veterinarian administer this. Morphine, to relieve the pain and straining, is excellent. Davis Scour Cure, used according to directions, administered every two or three hours, is very beneficial. If you have not this

remedy at hand you may use large doses of bismuth (2 to 4 drams) every two or three hours. These remedies serve as internal antiseptics. The veterinarian in attending to the patient will make his choice between zinc sulphate, copper, alum, chalk, tannic acid, lead acetate, etc. Moist heat should be applied to the belly, containing preferably a solution of Davis Veterinary Linament, in order to soothe the pain and overcome the straining. Injections may be good, but should be administered by the veterinarian; or have him prepare a suitable solution of quinine or silver nitrate, and instruct you how to go about the injection. A cocaine suppository used before the injection often does good work. Let the diet of the animal be light, consisting of such feeds as bran mashes, oatmeal gruel, etc., adding thereto 2 tablespoonfuls of Davis Stock Food, mixed with each feed.

Cerebrospinal Meningitis,

or Cerebrospinal Fever, is a contagious disease, which is especially characterized by an inflammation of the membranes of the spinal cord. Its course is irregular, and it may terminate fatally in the course of a very short period.

Causes.—All we know about it is that it is produced by a germ, one which we as yet know but little about. It is ascertained, however, that bad sanitary or hygienic conditions, foul, damp or dark staples, heat, overwork, and similar debilitating influences contribute to its development in the system.

Symptoms.—You may leave the horse well and hearty in the night, and when you come out to feed the stock in the morning you will find him down. Or you may find a number attacked simultaneously—one dead, another dying, a third down and unable to rise—all unable to eat on account of the paralysis of the throat which is one of the main symptoms of the affection. Great exhaustion is apparent, the tail is limp and lifeless, the paralysis gradually extending toward the hind quarters, and death quickly ensues. The disease usually terminates fatally.

Treatment.—You should not attempt to handle this disease yourself, but should immediately call a competent veterinarian. The affection is so grave that treatment rarely seems of any avail. The drugs used as counter agents are quinine, ergot, belladonna, potassium bromide, morphine, hypodermically injected, etc. Let the veterinarian select and apply these. Locally you may use cold applications, ice, etc., to the head. In milder cases, before the disease has become acute, and as a preventive, you may use Bradbury's Brazilian Specific. Given regularly it will be of material assistance, and if the horses are otherwise kept in good health and strength, by nourishing, proper feed, Davis Stock Food being a part of the daily ration, it will be the means of saving many an otherwise doomed animal. Always keep a supply of it on hand.

Septicemia (Blood Poison.)

This is a constitutional affection, caused by the system absorbing decaying and putrid matter from a wound. This poison enters the blood and causes the general infection of the entire system. It may interest you to know that the real cause, as it were, are bacteria, which have developed in the ferment or decomposition of the matter in the wound or glands. If the wound be a slight one, and the bacteria consequently only are present in small number, they will be destroyed when entering the healthy blood of the body, but if the wound be severe, and the putrid matter of such volume and character as to allow the bacteria to develop in large numbers, they will be victorious and cause blood poison.

Symptoms.—The symptoms depend upon how severe is the infection. As a rule they arrive with a chill, quickly followed by fever, and the temperature runs up as high as 105 and 106 degrees Fahrenheit. The patient now becomes dull, listless and prostrated; there may be streaks of blood in the urine and feces; perspiration is absent, and the skin is hot, dry and feverish. The visible membranes of the mouth, nose, rectum, etc., take on a dirty color of pale yellow. The beat of the pulse diminishes appreciably, becoming weak though quick; the breathing is labored and weak, and often bloody diarrhea sets in. The so called lymphatic glands, by which the septic poison enters the blood, same as by a wound, swell all over the body. It is a very dangerous affection in many cases, and, should the symptoms be severe and the constitution of the patient at the same time run down, fatal termination may ensue, while, if the animal be in fairly good condition, and the case comparatively mild, it may recover. (Always keep your stock in good condition, by proper feed and care, adding Davis Stock Food to the regular ration. It is ever a paying investment.)

Treatment.—Little can be done locally but to keep the wound open, clean, well cauterized, removing as much as possible of the poison as promptly as possible after the affection. If you do not know how to do this, call in a good veterinarian immediately and watch him remove the parts of the wound that are gangrenous, then cauterizing and applying a good antiseptic. Next time you may be able to do it yourself. It will be good policy for you to wash all putrid and other wounds you may discover in otherwise healthy animals with a solution of Phenalin and water, following the instructions given with the remedy. This you ought to do even before you have ascertained that blood poison has set in. Then, if you see that your horses are surrounded by good sanitary and hygienic conditions, fed properly, the addition of Davis Stock Food, 2 tablespoonfuls mixed with each feed being allowed, your stock will be almost entirely proof against this affection, and if it should occur the animal's power of resistance will be so great that the bacteria are unable to obtain any foothold.

Pyemia **(Blood Poison)**

is another form of the same affection, due also to the absorption into the blood of the poisonous matter from a wound, characterized by the formation of cysts or abscesses, with suppurative inflammation. Various parts of the body may be infected, causing general systemic or constitutional disturbance.

Causes.—It is due to bacteria or pus microbes, which have entered the blood through the putrid wound. In this instance these minute pests seem to group themselves together in families, taking up their residence in various organs, and immediately commencing to reproduce in great numbers, producing suppurative inflammation.

Symptoms.—Among the most conspicuous visible symptoms are the usual chills and subsequent fever; the temperature runs up to 102 to 104 degrees Fahrenheit. The chills come on spasmodically, at intervals, and the temperature is higher than in the ordinary stage of perspiration. The pulse is rapid, weak and irregular, or intermittent. Thirst, diarrhea and loss of appetite, with attendant exhaustion, prostration and general debility, set in. The breathing becomes quick and labored, and in the last stages there may be delirium, with the pulse very weak and intermittent. In passing into death the patient is generally in a state of semicoma. In order to enable you to distinguish between septicemia and pyemia let us add that, while the chill which ushers in the first is but a slight one, the chill in the second is marked and distinct; also that, while in septicemia there is but one chill at the outset, in pyemia the chills come and go. The perspiration in septicemia is but slight, while in pyemia it is profuse; in septicemia the temperature at once jumps up to 105 or 106 degrees Fahrenheit, while in pyemia there is a gradual rise. The first develops rapidly; the latter more slowly; in pyemia the heart beat is not so strong and distinct as in septicemia; finally, the abscesses forming in pyemia easily distinguish this form of the disease from septicemia, for they are never found in the latter. It is a dangerous affection, which often results fatally.

Treatment.—You should lose no time in calling in a good veterinarian when you discover that one of your valuable horses has been poisoned in this way. There are two kinds of treatment for the affection, one the preventive, the other the medical treatment of developed cases. The first, here as elsewhere, is by far the better, and simply consists in cleanliness, proper sanitation and hygiene around the stable, pure air, sunlight, regular disinfecting of the stalls and stable with such an antiseptic agent as Phenalin, correct feeding, and a nourishing ration, with Davis Stock Food added in the usual proportion, to keep the animals up to a high standard of vigor and strength. The treatment for the developed case is guided by the direction of the intelligent veterinary surgeon you have called to your assistance, and will consist in internal antiseptics, such as bromine, quinine, oil of turpentine, or carbolic and salicylic acids. What you can do to aid him is to administer a careful, stimulating ration, with 2 tablespoonfuls of Davis Stock Food added, to counteract the weakness and prostration which are part of the symptoms.

Tetanus.

This disease is more commonly known among us as lockjaw, and is attended by spasms and cramps, and other functional disorders, verging into delirium.

Causes.—A number of cases are recorded in which it was impossible to discover any cause, and these have been given the name of idiopathic tetanus. More often, however, the affection accompanies wounds, generally punctured wounds of the limbs. It also has been known and is frequently found to follow the entering of foreign substances into the tissues underlying the skin,

as, for instance, wood splinters. Again, castration, docking, ringing, or any other operation may bring it about; abrasions produced by the harness or saddle, or fractures of the vertebra, or any other small wounds may cause it. It is due to virus produced by a bacillus inhabiting the earth, manure piles, decomposing, putrefying fluids, etc. In finding its way into the wound this minute pest immediately enters the blood and sets upon its work of destruction.

Symptoms.—It usually takes about ten days after the infection for these to show. You will then note a slight stiffness of the neck, and there may be some difficulty shown by the animal in the process of mastication. You are alarmed by the suddenness of the symptoms that now follow. You go to feed the horse in the morning and notice that he seems awkward and stiff and refuses to eat. He persists in keeping his nose in the air, the tail slightly lifted and turned to the side; the hind legs are more or less stiff and kept noticeably wide apart, the gait straddling, head extended. In taking the horse out you find that he is peculiarly nervous and excitable, refuses to back, and as you turn him about the membranes are thrown over the eyes. If it is a severe case he will set his teeth, saliva will flow from his mouth, and so firmly are the jaws clasped together that you will not even be able to force the blade of a knife between the teeth. From this circumstance the disease takes its name, lockjaw. The temperature may run up to 105 or 106 degrees Fahrenheit, and immediately preceding or following closely after death it may reach as high as 110 or 112 degrees.

Treatment.—You should not attempt to handle the case yourself, but immediately you become aware that the disease is present call in a competent veterinarian. He will prescribe such drugs as opium in large doses, aconite, chloral, belladonna, callabar bean, Indian hemp, alcoholic stimulants, ether, chloroform. You should be very careful not to excite the patient. If you live in the country turn him out and leave him alone between treatments; if you are a city man put him in a dark box stall and leave him alone. Let one trusted, quiet and careful attendant administer to his needs, and keep all others away from him. Solid medicines are not advised for this disease, but the veterinarian will prescribe liquids concentrated as much as possible, administered with a syringe. Suppositories also are useful in such cases, and should be made up of morphine and atropine, $\frac{1}{2}$ or 1 grain of each, used twice a day. They have the advantage over medicines given by the mouth that they do not produce irritation of the bowels. It is said by some that a sudden fear producing a distinct shock will cure tetanus, and the old inhabitant will advocate such measures as shooting off a gun over his head, or throwing water over him; also throwing him bodily into some stream or shallow water. Others have it that the placing of a sheepskin over his loins, letting it remain there until it rots, will cure him. We, however, place no faith in these versions. All the intelligent breeder can do in handling a case of tetanus is immediately the first symptoms show themselves to call in a veterinarian, and keep the animal very quiet and comfortable, and after the veterinarian has visited you and given his instructions follow these implicitly. In some cases it will be advised to feed the patient through the rectum in place of the mouth, or perhaps to leave off feeding at all for the time being. In whichever way you may be advised to administer the feed (which should consist of gruels, etc.), you should always add 2 tablespoonfuls of Davis Stock Food to it, in order to keep the patient's digestion and circulation in order as far as possible. You may leave the pail containing the mixed gruel and stock food at the head of the patient, and, although he would not eat while you were present, he will often be found to have sucked it up during your absence. Tetatine is the name of an antitoxin for this disease, which has been used with different degrees of success. If properly used in the early stages it is often very successful.



CONSTITUTIONAL DISEASES.

P u r p u r a Hemorrhagica.

The most common name for this disease is dropsy, but it also is known under various other names, the most common being purpura, scarlatina, and petechial fever. It is a constitutional disease, originating in the capillaries and blood, marked by spots on the mucous membranes and swellings under the skin on different parts of the body. The blood leaves the vessels in the various organs, as the lungs, spleen, kidneys, and the tissues underlying the skin. A sticky, jelly like mass will develop, and the blood becomes darker than when in a healthy condition. The skin and mucous membranes also become similarly affected, and there may be hemorrhages here and there on the surface.

Causes.—The affection may be a primary one, which means that it has not been produced by or is not a complication springing from some earlier disease, but just as often, in fact, more often, is the latter the case, it being of secondary nature. Unhealthy sanitary conditions, bad drainage, dark, damp, ill ventilated stables, or enervating and debilitating conditions or diseases may produce it. At times it comes on without any previous symptoms at all.

Symptoms.—Where the disease is primary, in other words, not produced by an earlier affliction, they come on with a rush, so to speak. The horse loses its appetite, it shows symptoms of fever, legs become stiff and diarrhea may set in. If the case is a secondary one, you will find that, as the primary cause subsides, be it influenza, pneumonia, bronchitis, or any other debilitating influence, the convalescence of the patient is interrupted with the appearance of swellings on the legs and under the belly; they also may appear on the skin all over the body, but as a rule along the thighs, under the belly, between the fore legs, and sometimes around the nostrils. They may be big or little, hot and tense, and often sensitive or even painful to the touch. As the disease progresses they either disappear or run into each other, becoming even and uniform. If it is the head that is affected, the swelling may extend as high as the eyes; if the legs, the walk is stiff, jerky and difficult. The skin may dry and crack in spots, the rents becoming bloody, the patient is languid and prostrated, disinclined to move. There is not very much of a rise in the temperature to start with, but as the affection progresses it may run up considerably; the pulse, at first not very rapid, in the latter stages often doubles its beats; breathing is labored, especially when head is swollen; ribs become prominent as the emaciation progresses; swellings on the body and also that of the head in severe cases continue to go on, until the animal often presents a most ungainly appearance. The urinary organs, penis and sheath may become so large that urination and locomotion are interfered with. Often the sudden disappearance of these swellings is thought a favorable symptom, and it is thought that the disease is over; but only to be found that the patient lies down and dies in the course of the next few days; glottis of the lungs, gangrene of the lungs or internal hemorrhage bringing about the fatal termination. The time from the inception to the termination of the disease varies, but the average is three or four weeks. If the condition of the animal was good when the attack commenced, and the time of the year is favorable, recovery may result from careful treatment. It is, however, a fact that from 60 to 70 per cent of the animals die, and it has also been demonstrated that at times severe cases may recover and mild cases die.

Treatment.—In the more severe forms of the disease it is always best for you to call in a veterinarian. The treatment must be local as well as general, aiming at restoring a normal, healthy tone to the blood and blood vessels. You should be careful about the sanitary and hygienic conditions of the stable, feeding the animal on a nourishing but not too heavy ration, including double feeds of Davis Stock Food; this being of the utmost importance. The drugs recommended for the more severe forms of the affection are iron preparations, turpentine, alcohol, potassium chlorate, etc. A veterinarian of considerable practice and repute has advised strong coffee, 1 pint; potassium iodide, 1 or 2 drams; given three times a day. Potassium nitrate, given in the feed and drinking water is also recommended. If the head is much

swollen, use the fluid extract of *nux vomica*, 30 minims; spirits of turpentine, 15 to 30 drops; alcohol, 1 ounce; give this as a dose every three or four hours with a syringe. In the milder cases you may confine yourself to the general course of remedies indicated above, and at the same time assist with local treatment, such as rubbing, massage, and molding the swellings with cold water, stimulating liniments, such as Davis Veterinary Liniment, and hot water. You must not cut the swellings; if you do, gangrene is apt to follow. If there are wounds or abrasions anywhere on the skin you should wash them out with a good antiseptic, preferably Phenalin, and dress with the liniment.

Bleeder's Disease is an affection of a congenital nature, characterized by frequent or habitual attacks of bleeding.

Causes.—There may be a hereditary predisposing tendency to the affection, or it may be due to neurotic debility or a plethoric condition of the blood, or attendant on various nervous disorders.

Symptoms.—Especially prominent among these are the bleedings from the membranes of the nose, the mouth, the lungs, the stomach, the intestines, and the genito-urinary organs. It is often difficult to arrest these bleedings, which may be due to either plethora, congestion, or nervous debility. The malady is a serious one, and is often followed by death, although life sometimes may be prolonged for an indefinite period.

Treatment.—Potassium chlorate, fluid extract of *hydrastus canadensis*, mineral acids, etc., also tincture of the chloride of iron, are recommended, and may be obtained at the drug store. Mechanical, practical means and appliances are recommended, and you should resort to simple, common sense home remedies whenever possible. You will find that if you keep the system and organic functions, the digestion, circulation and their auxiliaries in good condition, by using Davis Stock Food regularly with a nourishing ration, suitable to the condition of the animal, you will be able in the majority of instances to stay this exhausting and destructive affection before it gains the upper hand.

Softening of the Bones,

which is technically called *cashexia ossifraga*, is a constitutional disorder, due, as a rule, to an insufficient supply of the calcareous salts in the bones of the mature animal, resulting in softening and deformity of the bones.

Causes.—It is an affection more common with the cow than the horse, is limited to animals of mature age, and may be due to an insufficient or improperly distributed amount of salts in the feed. Arid seasons, when the ground is dry, may bring it about, there being an insufficiency of moisture in the soil to dissolve the salts. If your pastures are wanting in lime salts, if your grazing lands are constituted mainly of a sandy, swampy, turfy consistency, you may find this affection among your horses.

Symptoms.—There is at the outset a constant hunger, or abnormally developed appetite. The patient may be found in the act of devouring foreign bodies, never before included in its diet, gnashing sticks and straws, licking the walls in the stable, especially if you have recently applied a coating of whitewash, or he may show a desire to lick your own clothing as you tend him. Stiffness ensues later, the animal crosses its legs and they often become entangled, and a cracking or snapping as of dry, loose joints may be heard between whiles. He throws himself down in his stall or in the field, as the case may be, and it is difficult to make him rise again. The voiding of urine and evacuations cause evident pain. As the disease progresses fever is apt to ensue, with increase in pulse, and exhaustion and emaciation gradually become apparent. The ligaments binding the joints together may loosen from their attachments or be absorbed by the bone, and as a consequence there may be discoloration and fracture of the bones of the hind quarters and pelvis. The pelvis often breaks down, and the ribs may become fractured. It is, however, not an especially dangerous affection, and if taken in hand in time, the patient being properly tended and fed, a cure may result. On the other hand, if neglected and allowed to run its own course, death from general debility and prostration often occurs.

Treatment.—Feed of improper consistency or quality is, as was indicated above, the usual cause, and the treatment hence should consist in correcting this. In other words, you must change the pasture and vary the ration. Davis Stock Food, fed regularly with each meal in accordance with directions,

will go far to make up the deficiency and speed the recovery. Also feed Davis Bone Meal twice a day. Grains, such as oats or dry clover, also fruit, are very beneficial and will help as corrective agents. Oil cake, included with the other feed, is good. Davis Stock Food as a stomachic, aiding the digestion and stimulating the assimilation, is, as indicated, quite indispensable for the correction of this form of ailment.

Rickets

is another form of the same disease, in so far as it consists in a softening of the bones. It is, however, a disease of youth, of constitutional character, affecting nutrition, and the animal may be born with it or it may be developed very shortly after birth.

Causes.—As before, there is a lack of the calcareous salts in the bones, this reacting upon their form and structure, impairing their growth and shape. It is a disease often met with in young foals, and its primary cause may often be traced to improper nourishment in the uterus of the mare. Insufficient feed, such as when after birth the foal is not allowed to suck its mother more than once or twice a day, or where the milk for some reason or other (generally improper feeding of the mare) does not contain the variety and quantity of the principles necessary to the healthy development of the bones and tissues in the young.

Symptoms.—It is not, as is believed by some, a local disease, confined to certain bones and tissues, but is a constitutional disorder, affecting all the bones of the body, including the tissues that surround them. There are the cases in which the pelvis becomes narrow, the spine twisted or curved (if curving downward, it is called saddle back; if upward, carp back or roach back; if the side, scoliosis). Often you will find that the bones have become softened so much that they will readily change their shape or form whenever a slight pressure is brought to bear upon them. The limbs will bulge and bend under the weight of the body, thus originating the popular names of knock kneed, cow hocked, pigeon toed, bow legged, etc., and the animal often presents an appearance that is at once grotesque and pitiable. If it is the breast bone that protrudes and stands out, we call it chicken breasted. The ribs of the poor animal also may bulge out prominently at the sides, so much so that you can plainly see the enlargements at the junction of the false and true ribs. The belly also protrudes, and pot gut is the common name given to this form of the malady. Other symptoms attendant upon the disease are loss of appetite; feverishness; general debility; inability of the patient to walk; teething delayed; teeth breaking through irregularly; muscles flabby and soft; flatulency and diarrhea may be present; also nervous disorders of various kinds, causing the patient to appear uneasy and apprehensive. As a rule this condition does not terminate fatally, but it often results in a deformed and otherwise unsound animal, conditions which may or may not interfere with its future usefulness. The constitution, thus early weakened, may also leave it in such a condition as to be especially liable to future affections.

Treatment.—In order to empty the bowels of any undigested material contained therein, first administer a purgative or laxative. Linseed oil in moderate quantity, and combined with potassium bicarbonate of sodium, given in the form of an emulsion, adding to the compound 1 tablespoonful of Davis Stock Food, may be used with good results. Then you can give the patient preparations of lime water or iron, two or three times a day if the stomach permits it; this, in moderate quantity, admixed with cod liver oil, will prove very efficacious. It also will be well for you to give a small quantity of Davis Bone Meal with each feed, Davis Stock Food, where a tonic is necessary, and, above all, pure, fresh air, moderate exercise and proper nourishing feed, in which the elements which go to make up the structures and tissues of the body are correctly admixed, the milk of a correctly fed mother being, of course, preferable to all others. If there is no other way, you may substitute this with pure, sweet cow's milk, adding a small quantity of lime to it. It is, however, far better that you take measures to prevent the disease long before it occurs, which you can do simply by feeding the pregnant mare with especial care and attention to the details in her diet—nourishing, strengthening feed, to which is added Davis Stock Food; a heaping tablespoonful to each feed. If, however, the disease has been contracted, treat as above indicated; aiding nature in correcting deformities by the use of padded splints, bathe the inflamed parts with a solution of Phenalin and water, and dress the sore and swelled or deformed parts with Davis Veterinary Liniment, or if you have not this at hand, resort to any other good liniment.

Big Head,

scientifically known as Osteoporosis, is a porous condition of the bone, enlarging the bone proper, and atrophying its substance. Climate and soil are factors in bringing about this condition, the absence of some of the salts necessary for the sustenance of the animal body being absent; presumably the soil substance is lacking in some of the essential ingredients for the formation of the bone. It is possible that the underlying cause of the disease and atrophy of the structures is a specific germ. In some districts of the United States it is very common as well among high bred as common work horses.

Symptoms.—The patient is in poor condition, feeds poorly, and his belly often presents a peculiar tucked up appearance. The legs stiffen with the progress of the disease, there is no action of the knees at all and he is forced to adopt the so called dog trot gait. The parts around the jaw seem to enlarge and pressure on the diseased bone tissue causes evident pain to the animal. In young animals the roots of the molar teeth give prominence to certain parts of the face. There may also be lameness present, supposed to be rheumatic in its nature, which shifts from one place to another and is difficult to localize and treat. As the disease progresses the patient may lie down and be unable to get up; he appears exhausted and emaciated, the bones of the jaws continue to increase, and the condition grows from bad to worse. If the patient is young and vigorous he may recover, while the affection often terminates fatally in older and poorer animals, it becoming necessary to kill them at the advanced stage in many instances.

Treatment.—Medical treatment is of but little avail. Turn the animal out to roam the pastures at will; in other words, liberate him to find the grasses and plants containing the salts which his body is in need of. Where soreness and pain in the joints is evident, give a liberal ration of ground oats, to which add Davis Stock Food in the proportion of 2 tablespoonfuls with each feed. This is always an excellent adjunct, of great assistance and value, and will do much to promote a speedy recovery. Sometimes you will find that a good physic, followed by cod liver oil with calcium phosphate, will be of assistance in the treatment. Locally you may use anodyne liniments. As a soothing, stimulating liniment you will find Davis Veterinary Liniment the best.

Diabetes.

This disease is divided into two separate forms, one of them called diabetes mellitus, the other diabetes-insipidus.

Diabetes Mellitus.

This affection may be designated as a disorder of the digestive and assimilative organs, causing sugar to accumulate in the blood to be voided with the urine, and the amount of which rapidly increases from day to day.

Causes.—Overfeeding is mentioned among the principal causes responsible for this affection; all corn or starchy feeds, which are rich in carbohydrates and peptones, are likely to bring it about, especially if you exercise the animal but little. It may also be caused by faulty action of the liver and its auxiliaries, and pregnancy as well as certain poisons peculiar to the generative organs may produce it.

Symptoms.—These are often slow to show themselves to any but the experienced eye, and as first indications that your animal is affected you may become aware of a perceptible loss of strength, impairment of the digestion, passage of great quantities of urine, which, when analyzed, are shown to contain sugar; there is a constant thirst; the horse is exhausted and emaciated and the least exertion seems to fatigue him; there may be an abnormal appetite, but still the general debility of the system seems to become all the time more marked and evident. The mouth is dry, saliva scantily secreted, the skin harsh and dry to the touch, urine pale and watery, emitting a sweetish odor. The majority of cases terminate fatally.

Treatment.—You should not attempt to treat the patient yourself, but as soon as you become aware that one of your horses suffers from diabetes call in a good veterinarian. If the case is a mild one and is discovered in time, good grooming and a careful diet, avoiding all feeds containing sugar, and the adding of Davis Stock Food, 2 tablespoonfuls to each daily feed, may bring about recovery. Among the drugs which the veterinarian will prescribe are potassium bromide, lithium salts, opium, etc.

Diabetes Insipidus.

In scientific language we call this form of affection polyuria or chronic diuresis. It is chronic in its course and accompanied by abnormal thirst, exhaustion and emaciation, and the voiding of a large amount of pale urine.

Causes.—It has not been possible to accurately define the causes, but it would seem that some injury or disorder of the nervous system, perhaps tumors of the brain or other irritating affections, are responsible.

Symptoms.—As in the case of the first form of diabetes, the symptoms at the outset are obscure and hard to discover. The passage of large volumes of urine, and great thirst, first indicates that the animal suffers from the affection; here, as in the first instance, the urine is watery and pale, mouth and skin dry, appetite fairly good, and the patient seems in good condition.

Treatment.—A good veterinary surgeon should be called. It is a difficult disease to treat, and but few of its victims recover. Davis Stock Food in the daily feed ration should be used as before.

DISEASES OF THE RESPIRATORY ORGANS.

The Physical Diagnosis

is a term used by the physician, and implies the art of discovering disease by means of the senses, more especially by the eye, ear and touch. Aided by modern instruments he is able to look into, listen to, or feel the condition, activity or respective state of the various organs of the animal body. The size, form, color, position and state of each part, together with the movements, etc., are noted and determined. By laying the palm of the hand and fingers on the diseased spot the nature and stage of the trouble may be discovered through the sense of touch. The heart beat, the condition of swellings, the frequency of respirations, the location of pain or soreness, etc., may be ascertained in this way. Technically this is known as palpitation. Through these means, eye, ear and touch, we are thus able to find out the condition of the various organs belonging to the respiratory system, the ear, however, being the medium most generally employed by physicians in diagnosing and determining the nature of pulmonary or lung diseases. The sounds heard within the normal chest vary in nature. In breathing, the inspiratory part of the sound is low, soft and breezy, while the expiratory sound is pitched in low, feeble accents, its rhythm being soft and blowing. It cannot always be heard. This respiratory murmur may become altered in intensity, rhythm, and character. Thus, for instance, when the respiration is exaggerated or increased, it may denote a want of action of some other portion of the lung, and it is, therefore, an indirect evidence in some part of the lung tissue. The volume or intensity of the breathing is diminished in old animals, the period of the inspiration and expiration being shorter. The rhythm of the murmur heard in the chest from the act of breathing, also may alter in various ways; or the quality of the sounds may change, becoming in turn harsh, soft, high or low pitched. Although these are technical terms, they may in a measure be understood by the laity. Thus what is called harsh respiration is where both the in and out breathing murmurs have lost their usual softness, this, as a rule, indicating a congested condition of lung tissue. By bronchial respiration is meant a condition of the organs where the in breathing becomes high pitched and tubular, while the out breathing is even more high pitched, prolonged and tubular. Cavernous respiration is indicated by a blowing sound of peculiar nature. It is heard, as a rule, over a cavity communicating with the bronchial tubes. Amphoric respiration is indicated by a blowing kind of breathing, which is heard over a large cavity with firm walls, and which is of a sonorous, musical quality.

In rales we have another technical term, which is invented for the convenience of the veterinarian and physician, consisting of sounds peculiar to a diseased condition of the respiratory organs, and never present in health. According to their character, and the conditions under which they appear, they are divided into several classes, primary among these being dry or moist rales. Again, depending upon their situation, we divide them into bronchial, cavernous, laryngeal, pleural and vesicular rales. Dry rales are produced when the bronchial tubes are clogged or narrowed from a thickening of the mucous membrane, especially when the mucus is of a consistency that cannot be broken up by the air. If occurring in the smaller bronchial tubes they are high pitched, and we then denominate them whistling or sibilant sounds; if occurring in the large tubes, they are low pitched, and we distinguish them

under the name of sonorous rales. The breathing does not interfere with the position of dry rales. Moist rales are caused by the inhaled and exhaled air passing through fluid matter which is readily disturbed and displaced by the air. In the large tubes we call them large bubbling or mucous rales; in the small, small bubbling, subcrepitant or mucous rales. This kind of rales are acted upon and influenced by the breathing, and as the mucus is loosened in the tubes and coughed up, they may change their position from one place to another. In laryngeal rales are indicated those heard over the larynx and trachea; they may be either dry or moist. Moist rales, in this connection, are known as death rattles. Bronchial rales vary in character, and may be either dry or moist. We denominate the dry variety the sibilant or sonorous, while the moist are large or small, bubbling or mucous rales. With vesicular rales is meant a very fine sound or a series of very fine sounds, which are heard only when the air is inhaled. We also call it a crepitant rale, and the noise it produces resembles that following the throwing of a handful of salt on the fire. This is the sound heard in the chest during the early stages of pneumonia. The so called cavernous or gurgling variety of rales may be heard over lung cavities containing liquid, when these open into the bronchial tubes. Pleural rales are murmurs in the chest, caused by the rubbing over each other of the two hardened layers of the pleura. Sometimes they are dry and sometimes moist. In the dry state there is a friction sound, which denotes the early stage of pleurisy, and when this dry friction sound changes into a moist and watery murmur it means that the third stage of the disease has been reached. The way for you to go about in endeavoring to locate and distinguish between these various sounds is to either place your ear against various places of the chest, changing around until you strike upon the spot where the disease is located, or, if you have gained considerable skill in diagnosing disease in your animals in this way, you may be able to make a pretty correct diagnosis by placing the ear to the nostrils. This is the method preferred by the skilled veterinarian.

DISEASES OF THE NOSE.

Catarrh of the Nose.

Two forms—acute and chronic. The acute form is also called coryza, or more simply, cold in the head, and consists of an acute catarrhal inflammation of the membrane of the nose. It is indicated by a feverish condition of the system, the discharge from the nasal chambers being excessive and often offensive.

Causes.—Changes in the weather are apt to produce the so called idiopathic or primary form of coryza; more especially inclement weather in the autumn and spring, when the skin is exposed to cold or wet. It has also been met with as a result of the inhaling of poisonous gases, dust or smoke, or moldy hay, and dirty, unfit feed may bring it about. As a rule it is complicated with other functional disorders of the general system, more usually in the form of ulceration of the membranes of the nose, glanders, bronchial affections, or a general state of nervous debility.

Symptoms.—As has been indicated above, there are two stages of the disease, known as the dry and moist stages; also called simply the first and second stage, the distinction being that the condition of the organs of respiration vary from dry to wet or moist. The affection generally sets in with a cold in the head, the patient appearing listless and dispirited, as if suffering from a severe headache; appetite is impaired; there are chills and shivers, then fever, elevating the temperature a number of degrees. The membranes turn red, dry, thickened and irritable, and the animal has frequent spells of coughing and sneezing. Its condition may remain in this way for a number of hours or for several days. This is the first, or dry stage, of the disease. In the second, or moist stage, we have a much swollen, shiny and red mucous membrane of the nose, complicated with a discharge, at the outset consisting of thin, watery matter, and later on changing into a thick, sticky, gluish mass, whitish in color, as a rule, on account of its connection with the white blood corpuscles, although in some cases it may turn yellow and putrid, with offensive crusts adhering to the nostrils. At this point the membrane of the eye may be infected, taking on a red and dry appearance, which is soon relieved by a discharge, at first thin and pale, then turning into a sticky, pus like matter. In the milder forms the disease may run its

course in a week's time, but if the attack is severe twice that period or more is consumed. If your animal is in first class condition, in other words, if you took proper care of him in health, looking after his sanitary and hygienic well being and seeing that his diet was the correct one, nourishing and strengthening in substance, with 1 tablespoonful of Davis Stock Food added to each feed to keep the digestion and assimilation perfect, he has a good chance to recover; but if he was poor in condition, his constitution run down and his powers of resistance weak, you have an equally good chance of losing him; the moral of which is that it always pays to keep the stock in good condition, strong, active and vigorous!

Treatment.—You must treat the patient both locally and constitutionally, as it were. Or, if the case is a simple one, not complicated in any way, simple, common sense nursing, with Davis Dis-temper Cure added to the feed in the proportion described on the package, may be all that is necessary. You should keep his body warm by application of bandages and blankets. Give the patient a stall by himself where the air can be kept pure and fresh, without drafts entering. If he is uneasy or gives evidence of pain, you may relieve him by administering a moderate dose of quinine, camphor or opium. If you have the facilities, you may also resort to steaming; for instance, you can prepare a remedy for steaming by filling a pail three-quarters full of bran, then pour hot water on it, finally changing the steaming mass into a feed bag, and place this in such a way that the animal is compelled to inhale the steam. Be careful not to encase the breathing organs of the horse too completely, but allow as much room as will enable him to inhale the air at the same time he sniffs up the steam. If there is much fever, use Bradbury's Brazilian Specific—one of the Davis Preparations, guaranteed excellent as well as harmless in cases of this nature. It is a splendid fever remedy. Let the diet consist of bran feed, easily digested, to which you have added Davis Stock Food in the proportion of 2 tablespoonfuls to each feed. If there are symptoms of constipation, rectal injections, or a tartar emetic given in the drinking water will give relief. Easy digestion and assimilation, as insured by the regular use of Davis Stock Food, should always be made an object. It reacts upon the entire constitutional circulation, and amounts (when used properly and in time) to little less than an insurance policy for 75 per cent of the diseases common to our domestic animals.

Chronic Catarrh of the Nose is the more serious affliction of the two. It is also sometimes called nasal gleet, and it may be defined as chronic inflammation of the membrane which lines the inside of the nostrils. It is generally complicated with excessive discharge from the nose, and there may be alteration of the structure of the organ gradually occurring as the disease progresses.

Causes.—Sometimes it follows in the wake of an attack of acute catarrh of the nose, often also some special cause produces it; as, for instance, decayed, putrefying teeth, irritating substances which have become lodged in the nose, ulcerations in the passages, glanders, or anything acting upon the membrane in such a way as to produce profuse secretion, followed by an increasing discharge of a sticky, pus like nature. The disease is more rare than the other form, and naturally, being of a chronic character, more serious in its ultimate results.

Symptoms.—The veins of the membranes of the nose may be swelled, large, dark blue, stained with blood. A discharge of thin, watery matter accompanies the first stage, this matter gradually gaining in consistency and yellowish or greenish yellow in color, often containing dead tissue. Should the patient keep its head lowered for any length of time, as when in grazing, this flow of matter from the nostrils is perceptibly increased. Should the secretion of matter be due to the presence of one or more putrefying, decaying teeth in the mouth, its odor will be strong and offensive. If the cause is accumulation of pus in the sinuses, no matter what is the nature of the agent responsible for this, it is at times indicated by a swelling of the bones of the head over the affected part. As stated, this is a slow, dangerous disease, which may extend its course over a lifetime, and cannot be too carefully guarded against. Neglect is often the original cause of its contraction.

Treatment.—Patience truly becomes a virtue in the treatment of this condition, for treat as you will, the fact remains that a large percentage of animals so afflicted can only be temporarily relieved, but never get well. If you find that the discharge comes from the membrane of the nose, no pus being present in the sinuses, inhalations may be resorted to. If you do not know exactly how to go about this,

better call in a veterinarian, have him show you the way and then you may be able in the future to look after the patient yourself. If there are no serious complications, such simple remedies as tar deposited on a heated shovel, or juniper berry, or sulphur, put before the patient in such a way that it inhales the fumes arising, may give immediate relief. Steam from a solution of Phenalin and water, or, if Phenalin is not at hand, you can use plain carbolic acid and water, creolin, etc., for steam inhalations. If fever is present, use Bradbury's Brazilian Specific. Blisters, such as Davis Veterinary Blister, applied over the nasal chambers (above the nostrils) may do good. A very simple remedy, which often brings great relief to the sufferer, is the blowing into the nose of iodoform in powder form. Internally give Davis Distemper Cure, together with a plain, nourishing ration. In order to keep the digestive and assimilative processes healthily active, and to keep the animal in fair vitality, thus increasing its resistive powers 50 per cent, you should always add Davis Stock Food, 2 tablespoonfuls to each feed, to the ration. In all cases where there is a virulent discharge from the nose the animal should not be permitted to drink from the common stock trough.

Nose Bleed,

which in technical language is called epistaxis, indicates a systemic disorder, sometimes local, and sometimes constitutional, which causes bleeding from the nose.

Causes.—It may be a general run down condition of the system, causing impoverishment of the blood and nervous debility, or there may be some foreign substances lodged in the nostrils, setting up irritation, or the hard bumping of the nose against an external object may produce it. Ulcers of the nasal cavity may also bring it about. Your horses will be more likely to fall victims to this affection in the summer time, especially after they have been driven or worked hard. There is a congestion in the lungs or some part of the membranes of the nose, and it is relieved by bleeding. If the blood originates simply from the mucous membrane of the nose, it will flow in a clear, unobstructed stream or in rapidly succeeding drops, but if the lungs are at fault, it will look dark and frothy, the reason being that it is now mixed with the air in the tubes.

Treatment.—Relieve the patient of all strain, keep him quiet and at his ease; apply ice or ice cold water to his face in a gentle, soothing way, and blow tannin and the like up into the nostrils. In severe cases it may be necessary to plug up the nostrils for a while. Internally give Davis Stock Food, 2 tablespoonfuls to each feed. If the affection, as is sometimes the case, should turn out to be a complication of some other disease of a grave nature, call in a veterinarian. But this is not often the case, although usually the general system is run down on account of overwork and incorrect diet.

THE LARYNX.

Laryngitis,

commonly known as sore throat, is a condition which may be either acute or chronic, or run its course from the first to the second, if the case is neglected.

Acute Form of Laryngitis

means a severe inflammation of the membrane which lines the larynx. It is indicated by a feverish condition of the system, cough, and sometimes difficulty in swallowing, complicated with catarrhal inflammation.

Causes.—Exposure to wet and damp weather, cold slush underneath the foot, chills, especially when the animal is covered with a comfortable coat of hair and is easily made to perspire. It is essentially a fall and spring disease, or it may be said to be an affection primarily caused by any changes in the atmosphere from cold to warm and vice versa, with accompanying storms, rains or other inclement conditions of the weather, reacting upon the blood. In rare instances inhalation of smoke, dust, or irritating gases may be to blame. Or there may be some unnatural pressure or mechanical injuries of the parts. Again, it is occasionally associated with catarrh of the nose, influenza, strangles, etc.

Symptoms.—A feverish condition associated with chills, the pulse being rapid, the temperature running up to 104 or 105 degrees Fahrenheit, are among the earliest symptoms. There is also a cough, at first sharp and hard, but as the disease progresses, loosening and accompanied with expectoration.

At times the patient may modify or suppress it on account of the attending pain. Often you will find the animal extending its head into the air, holding it in a horizontal position; if you press on the throat over the larynx it will cause him to wince and cough. You should not make this experiment except when you wish to make an examination or diagnosis, as it causes pain and irritation to the patient. The appetite is very much impaired, and the patient is often unable to partake of solid nourishment. Glands are swollen, temperature high, and the irritation and cough continues.

Treatment.—Counter irritants, such as Davis Veterinary Liniment, or for want of this, mustard, a number of applications, one after another, if necessary, will prove beneficial and give much relief. In treating internally you should avoid all bulky medicines, and feed Davis Stock Food, 1 tablespoonful to each feed. Davis Distemper Cure also is recommended as a positive cure for this condition. Steaming hot water, medicated with Phenalin, and used as an inhalation, may be found of much benefit in this connection. If the fever during the course of the disease is high, with the membranes dry and harsh, use Bradbury's Brazilian Specific, or, for want of this standard fever remedy, potassium nitrate with small doses of tartar emetic may be given in the drinking water, three or four times a day. It will also be well for you as part of the treatment to feed bland and easily digested feeds, to which add Davis Stock Food in the proportion of 2 tablespoonfuls to each feed. You should also be careful to keep the manger perfectly clean, washing it out thoroughly, as otherwise particles, wet with the discharge from the throat, may be left therein as a source of infection. A good plan is to feed the patient out of a clean pail, coaxing it to eat. Davis Stock Food is exceedingly appetizing, and therefore will materially further this end.

Chronic Laryngitis is generally the result of the earlier or simpler stages of sore throat neglected, and for this reason enters into a chronic state, involving the lining membrane of the larynx, with the submucous tissue, a chronic state of inflammation with a persistent cough being present.

Causes.—As stated, it may be the result of a neglected cold, or, again, any other disease of the lungs or throat may be the originator, while at times it is itself a primary disease without forerunner of any kind.

Symptoms.—Among the symptoms you will find the dry, hoarse, persistent cough most marked and suggestive of the malady. In other respects the animal may be in apparent good health, with good appetite and no appreciable loss of strength. But should you take him from the warm stall out into the chilly morning air, he will immediately start to cough, and the attack will be attended with a white, gluish discharge from the nostrils. Throughout the disease there will be tenderness and pain over the laryngeal region, and an appreciable thickening of the membranes due to the veins being more or less clogged up in the vicinity. It is needless to state that this disease, especially in old animals with lowered vitality, is difficult to cure. The way to avoid it is to keep the system in healthy, vigorous condition at all times by allowing your animals a wholesome nourishing ration, to which Davis Stock Food is added.

Treatment.—This is about the same as in the acute stage of the disease. Relieve the cough with Davis Distemper Cure. Throughout the disease double the amount of Davis Stock Food allowed with each feed, making it two tablespoonfuls instead of one.

Roaring

is a peculiar hissing or whistling sound emanating from the respiratory tract, due to an irritation or otherwise diseased and congested condition of the parts. It is also called chronic whistling.

Causes.—Roaring is often brought about by debility or degeneration of the surrounding tissues. Again, there may be tumors present in the nose, the nasal membranes may be swollen or thickened for some reason or other, giving rise to the sound by congesting or obstructing the passages; or it may be a tumor in the chest or bronchial tubes or fracture of the cartilage of the trachea that is to blame. Some veterinarians also claim that the affection may be due to hereditary causes, and that horses with straight, Roman noses and long, thin necks are more liable to contract the disease than others. The fact remains that any congestions or obstructions of the respiratory organs, nose, lungs, throat and bronchial tubes may produce this condition. In the more serious cases there is never much hope of complete relief or recovery from this abnormal condition, although relief may be afforded, and the animal remain quite useful in spite of its handicap.

Symptoms.—The affection is characterized by two different kinds of sounds, and according to the tone and quality of which it is defined as either whistling or roaring, the patient taking the name of a whistler or roarer. When the pitch is high and sibilant we call it whistling, when lower and more sonorous, it is roaring. Take your horse, afflicted with the disorder, out for a brisk ride, gallop him up a hill, then bring him to a sudden stop, bend down and listen to his breathing, and you will be able to tell whether he suffers from the one or the other form of the affection. In heavy work the sounds often may be heard distinctly, making a diagnosis possible.

Treatment.—Often a good blister, such as Davis Veterinary Blister, may be used with good results. Great relief may be afforded, but no complete treatment for this affliction has so far been discovered. If you have recourse to a first class veterinarian the operation of tracheotomy or laryngotomy may be resorted to, but the tubes inserted as part of this operation produce a great deal of inconvenience. They cause the air to enter directly into the lungs, without being heated, and as it is often filled with dust and other impurities, it is obvious that much mischief is done. Tubes, if put in permanently, have to be taken out every three or four weeks, or oftener, to either be thoroughly cleansed or a new tube inserted. This, of course, takes time and considerable skill, a veterinarian being necessary at the start.

In order to make the patient as useful an animal as possible in spite of his affliction you should keep his digestive and assimilative powers up to a high degree of efficiency by adding Davis Stock Food to every feed.

DISEASES OF THE BRONCHI.

Bronchitis.

This may be simply defined as an affection of the breathing organs, including the bronchial tubes, trachea and larynx. In the horse we divide it into Acute Catarrhal Bronchitis of the Large Tubes, Chronic Catarrhal Bronchitis, Acute Capillary Bronchitis and Bronchiectasis.

Acute Catarrhal Bronchitis.

The disease which you usually call simply cold on the chest, is an inflammation of the membrane which lines the larger and middle sized bronchial tubes.

Causes.—It may be caused by an exhausted, debilitated condition of the general system, poor blood, nervous debility, chills, impure air, sudden changes in the atmosphere, or any foreign bodies lodging in the bronchial tubes and setting up irritation may bring it about. It also may be secondary to the other ailments peculiar to the respiratory organs.

Symptoms.—The milder forms of the ailment, where the tubes are not affected, are often unaccompanied by any pronounced symptoms, and it is only the more severe stages that are easily recognizable. Sore throat, chills, shivering of the body, however, mark the approach of the malady; as the ailment progresses the pulse appreciably softens and weakens, its beat being feeble and rapid, there is high fever and the temperature may run up to 105 or 106 degrees Fahrenheit, with quick and labored breathing. The appetite often decreases, the visible membranes of the mouth, nose, rectum, etc., redden, the urine is highly colored, often scanty in volume, the cough is at the outset harsh and dry, hacking and hard, but soon loosens and followed by expectoration or a frothy, yellow mucus, which attains a sticky, pus like character. The expectoration brings relief to the patient and it rests easier. If not attended by complication, and if you take good care of the patient, the horse, as a rule, will recover.

Treatment.—This should be both of a constitutional and local character, and you should try to aid the expectoration and discharge by administering inhalations of camphor, Phenalin, or ammonium carbonate; tartar emetic is often of great benefit, as it hastens the secretions. Sedatives or opiates may be used with benefit in some cases, while in others carbonate of ammonia, or muriate or chloride of ammonia are recommended. Let the local treatment consist in counter irritants, such as Davis Veterinary Liniment, applied around the chest, preferably under a dressing of oiled silk or the like, which may be held in place by a six-foot flannel bandage. This, over the liniment, is an excellent counter irritant, as the air cannot penetrate the silk, and a constant state of sweating is thus being kept up underneath. If

the appetite is poor, you may stimulate it with Davis Stock Food, added in the proportion of 2 tablespoonfuls to each feed, which is excellent as a stimulator of the digestion and assimilation. If great exhaustion should ensue, you may give the patient a dose of whisky, alcohol or quinine. Let the temperature of the stall be about 60 to 65 degrees Fahrenheit, the air being pure but no drafts present. The patient should be blanketed and otherwise kept snug and comfortable. Before you apply the liniment and bandages it is well to give the parts a good rubbing with the hand. A moderate quantity of potassium chlorate in the drinking water has a cooling, quieting effect, relieving the fever and nervousness. The alcohol, whisky, etc., recommended in cases of great exhaustion and debility, may be administered effectively in the drinking water. If you are not somewhat familiar with the various drugs recommended above, and do not know how to administer them, you must call in a veterinarian and have him do the treating at the outset. You should feed the patient on easily digested feeds, such as steamed oats, bran mashes, fresh grass, carrots, apples, etc., always including Davis Stock Food, 2 tablespoonfuls to each feed, with the regular ration.

Chronic Bronchitis.

In this case the membrane lining the larger bronchial tubes is in a chronic state of inflammation, and there is a more or less pronounced constant cough.

Causes.—Old animals are most susceptible to the affection, and it is generally found that a sequence of attacks in the acute form are responsible for the chronic termination. Any form of lung or throat disease may be followed by it. Again, where chronic disorders of the heart are present, causing the blood to be retarded in the lungs, this affection may result as the consequence of the irritation set up in the bronchial mucous membrane. In rare cases it is of specific origin, or it may be a complication of renal diseases.

Symptoms.—Most pronounced among these is the sharp, irritating, distressing cough, which is attended by whitish or yellowish white expectoration of varying consistency, especially evident in the fall and spring, or whenever there are abrupt changes in the weather. If the patient is old and suffering from heart disease, its breathing may be peculiar, enhanced by much puffing and blowing when it is obliged to exert itself in any way, as in pulling heavy loads over bad roads or being driven rapidly up hill. The temperature remains uniformly normal, no appreciable rise being present. The condition may be much relieved, but a complete cure is difficult, especially when the horse is old and its condition poor.

Treatment must be selected to suit the varying symptoms and complications. It is often found that a change of air and surroundings, much as in the human being suffering from exhaustion or nervous disorders, etc., is greatly beneficial, and if you live in the city and have the facilities, you may, with advantage, give your sick horse a vacation in the country. If the expectorations and discharges are excessive, have a veterinarian prescribe a suitable solution of muriate of ammonia and senega, or iodide of potassium with nitric acid, you guiding yourself entirely by his directions and advice. Turpentine, administered in moderate doses, from 15 to 30 minims in alcohol, may be given with good results. Bradbury's Brazilian Specific, used in accordance with directions, is excellent in cases of this nature, and should always be kept on hand. Zinc is recommended by veterinarians for the stoppage of excessive discharge or secretions from the organs involved. It is said to diminish the cough and loosen or ease the expectoration, entering into a chemical combination with pus like fluids. Gargles of Phenalin solutions may also be administered with good results. As a counter irritant, Davis Veterinary Liniment applied to the chest, is often of much assistance. And do not forget that here, as elsewhere, it is of the greatest importance always to keep the circulation easy and unimpaired, and the digestive and assimilative functions up to a high degree of efficiency, by a carefully selected, nourishing diet, including Davis Stock Food, 2 tablespoonfuls to each feed. Plenty of green forage, succulent grasses and fresh vegetables, should be included in the daily ration.

DISEASES OF THE LUNGS.

With pulmonary congestion is understood a congested condition of the lungs, the capillaries of the air cells being enlarged and in an abnormal state, interrupting the normal functions of the organs. We divide the disease into two forms, which are called the active and the passive.

Active Congestion of the Lungs. This condition may arise when the animal has been overworked, the heart's action increased, sudden inhalation of an ice cold or burning hot draft, irritating gases, smoke or dust. The affection is frequently met with in the late autumn, after you have kept the horse stabled for a while, feeding him well, and with little or nothing to do; then, when you some day take him out on the road and drive him along at a rapid gait, he may contract an attack of congestion of the lungs; the same thing being the case in a rain storm, or during the first snow storm of fall, if you take the confined horse out of the comfortable stable and drive him rapidly through the inclement weather. The same form of congestion is also met with in heavy draft horses, especially such as are just being broken in, during the hot spells of summer, when the animals are forced or overworked. In short, overloading or overworking a well fed, heavy horse, not accustomed to the strain, and under severe spells of hot, cold, or otherwise inclement weather, may cause congestion of the lungs.

Symptoms.—It should be recalled that congestion simply is the first stage of all inflammations of the breathing organs, and may be succeeded by such diseases as bronchitis, pleurisy, pneumonia, etc. In the beginning you may notice chills and shivers, then the temperature may run up as high as 103 or 104 degrees Fahrenheit. The breathing becomes labored, inhalations and exhalations seem difficult, and the cough at this period sets in. The pores of the skin clog up, pulse is weak and feverish, body, especially such parts as the ears and extremities, cold and clammy to the touch. As was stated above, the disease comes on abruptly under favorable conditions.

Passive Congestion of the Lungs. Certain disorders in the circulation, causing congestion or obstruction in the blood vessels, the free coursing of the blood through its veins being interrupted in such a way that it is dammed up in the vessels of the lungs, are responsible for this affection. The return of the blood to the heart is retarded or altogether stopped, and the congestion results. Old or debilitated horses are more likely to contract this disease than young and vigorous ones, and in some cases it may be brought about by pressure of tumors, without any regard to age or condition. When the heart, due to old age or debility, becomes weakened and excitable the animal is prone to fall a victim to the disease; and it has been known to occur in a horse that had been lying on its side for a considerable period of time and in the same position.

Symptoms.—The disease is indicated by labored, difficult breathing, cough, fever, the temperature running up to 101 or 102 degrees Fahrenheit. The pulse is intermittent and weak, and in the majority of cases it will be found that the patient is an old animal in poor condition. In spite of this, most cases are likely to recover if good care and a nourishing, stimulating diet are administered as promptly as possible. In cases of this nature a stimulant, digestive and tonic, such as Davis Stock Food, is indispensable.

Treatment.—Sedatives and stimulants, such as whisky, alcohol, quinine, belladonna, carbonate of ammonia, etc., given in moderate doses, varying to suit the needs of the constitution of the patient and extent of the disease, should be administered. If Davis Stock Food is used regularly these remedies may, however, often be dispensed with. A good counter irritant, such as Davis Veterinary Liniment, or if you should not have this at hand, simple mustard, may be applied with good results, especially where the pulse is low and the patient suffers from chills and cold extremities. Let the ration be plain and nourishing, with 2 tablespoonfuls of Davis Stock Food added to each feed.

Pulmonary Oedema is the technical name given to indicate the presence of an accumulation of serous fluids in the air cells and small bronchials. It is characterized especially by shortness of breath, and may terminate in congestion, complicating the heart, brain or lungs, death being preceded by a rattle in the obstructed passages.

Symptoms.—The disease is a complication of some other existing affection, which may be confined to the heart or the lungs, or may be of a constitutional nature. There is a sharp, dry and painful cough, and often a discharge from the nose of a frothy, sticky, offensive nature. Signs of pneumonia, and a general feverish condition of the system often accompanies the inflammatory form of the malady. It is a difficult disease to cure, and frequently terminates in death.

Treatment.—To relieve the fever and inflammation use Bradbury's Brazilian Specific, and as a local counter irritant you may apply Davis Veterinary Liniment. Iodide of potassium or carbonate of potassium are among the remedies which are likely to be prescribed by the veterinarian. You should call one as soon as you find that the patient is seriously affected, and let him do the first prescribing, in order not to make any mistakes. Let the diet be plain and wholesome, with Davis Stock Food added to each meal in the usual way.

Pulmonary Hemorrhage, which is also called Broncho-Pulmonary Hemorrhage, or pulmonary apoplexy, is a condition where blood enters the tubes and air cells, and is expelled therefrom in the form of a discharge or expectoration from the nose or mouth.

Causes.—It may be caused by any kind of heavy strain, overwork, overheating, or it may be secondary to affections of the heart, where the valves are involved. Ulcerations existing in the breathing organs, due to diseases like purpura hemorrhagica, gangrene, or simple abrasions and mechanical injuries, may be to blame. At times it seems to come on without any apparent cause whatever.

Symptoms.—In the milder cases it is hard to define the symptoms, but if the attack is more violent and the parts involved extensive, puffing and blowing, with more or less labored breathing is often evident. Coughing, nervousness and restlessness, the patient being in a state of perspiration, with signs of the oncoming hemorrhage, may be present. In the more serious cases the extremities chill, the membranes turn pale, and the pulse is thready and feverish. Bleeding comes on of a sudden, as for instance, after a hard drive, when the hot, perspiring animal is brought to a standstill; there is a sudden cough, and the blood runs from the nose and mouth without any other kind of warning. At times the amount may not be large enough to cause any considerable trouble, and again it may be so great as to produce death by suffocation. Blood emanating from the lungs and air passages in this way is, as a rule, of an alkaline character, intermingled with mucus, and of a dark, frothy appearance. Often it is clotted, the clots being large enough to clog up the smaller tubes, the clots being of a soft, gluish consistency, intersected with air bubbles. Except in severe attacks, there is no immediate danger, and you should not allow yourself to become unduly alarmed, but calmly set to work relieving the animal.

Treatment.—First see that the patient is made comfortable, allowing the horse perfect rest for a while, feeding it lightly, and adding Davis Stock Food to each feed (2 tablespoonfuls). If you are in position to administer a moderate dose of opium (one ounce), its quieting effect will be beneficial, it diminishing the action of the heart. Aconite may be of assistance, if the patient shows uneasiness and excitement, as the tendency of this drug is to lower the pressure of the blood. The same holds good of purging, which may be resorted to with good results. Local treatment should be resorted to, as the main danger in this affection lies in the clogging up of the lungs with blood clots or the thick, frothy, bloody discharge which often is present. You should, therefore, not try to stop the cough, but rather encourage it. Gently apply cold applications to the chest and throat, and in the same way you may, with good results, apply Davis Veterinary Liniment to the throat. Inhalations of Phenalin vapors, or vapors of vinegar, not too strong and irritating, are also recommended. Keep the digestion and general circulation of the blood in order by using Davis Stock Food as indicated above.

Pneumonia, commonly known as lung fever, consists of an inflammation of the lung structures (the so called vesicular structures), causing congestion and discharge. We usually divide the disease into three forms, the lobar, in which the lobes of the lungs are attacked, the lobular, in which the lobules of the lungs are affected, and the interstitial, where the disease is lodged in the connective tissues.

Cause of Acute Lobular Pneumonia.—Expert investigators seem to agree that this form of the disease is caused by certain germs of a malignant nature, and it is of interest to note that it most readily attacks the younger and stronger members among the horses—vigorous, well nourished, and carefully looked after animals, that seem to be in the best of health. It may be brought about by exposure to inclement weather, drizzling rains, snow storms, sudden changes in temperature, the inhalation of irritating gases, smoke, dust, external burns, extending over a large space, medicine poured into the trachea, or foreign bodies lodged in the bronchial tubes, traumatism (horses run into with a pole or other blunt point, striking it heavily between the ribs), etc. In some instances it is impossible to find any cause to account for its appearance. As is well known; in the human family one attack predisposes the patient to another, but this rule does not seem to hold good among animals. For the more easy study of the phenomena connected with pneumonia, we divide the disease into three stages, called the stage of congestion, the stage of red hepatization, and the stage of gray hepatization.

In the first or congestive stage the lower frontal parts of the lungs are affected, and the affection spreads upward and backward through the organs. The affected organ is deep red in color, firm and solid to the touch (abnormally so), and if, after death, you should dissect it the surface will exude a quantity of albuminous, thin and bloody liquid. In the second stage the affected organs have an appearance similar to the substance of the liver. In opening the chest you find the lungs greatly swelled, abnormally large, and without elasticity, the surface of them often being marked by the impress of the ribs. The organs are firm and solid to the touch, devoid of air, and if you put them in a vessel of water they will sink at once. (When the lungs are in a healthy condition they will float.) The passages or air cells are filled with matter, a fibrous, viscid liquid, full of quickly coagulating white and red cells, which completely fill the tubes. You will find the surface of the organs dry, liver colored, and granular, the tissue tearing easily. This form of pneumonia is, as a rule, confined to certain parts of the lungs, not spreading over their whole surface, as a rule affecting one-half or one-third of one of the organs. It may, however, spread to both lungs, and is then known as double or bilateral pneumonia. When only part of one lung is involved we call the disease unilateral. The great majority of cases coming under this heading are unilateral. The disease gradually, and without any very abrupt demarcation, enters from the second into the third stage. The reddish brown liver color now turns into a grayish white, there is more moisture to the surface of the organs, and the passages are less clogged with matter. The lungs sometimes take on the hue and appearance of marble, the red blood cells having largely disappeared, and should you repeat the experiment of putting them into a vessel of water they would sink quickly.

Again, in defining the course pursued by this dangerous affection, the professional man makes use of three terms, which are (1) resolution, (2) production, and (3) destruction. Resolution is where the matter existing in the tubes liquifies sufficiently to be reabsorbed by the lung tissue, with the result that very little is coughed up or expectorated. It may interest you to know that in the human family the death rate in pneumonia is alarmingly high, estimated at only one recovery out of three or four cases. Again, in man the prospects for recovery are best between the ages of fifteen and thirty years. But in the horse the rule is that eight out of ten afflicted animals survive and regain their normal health.

In chronic interstitial pneumonia there is a marked increase in the interstitial (interspace) tissue. In the horse the affection rarely terminates in this way. By destruction is meant the state in which gangrene or suppuration sets in in the organs. If it is suppuration, or the forming of an abscess in the tissue, the symptoms of the previous stages will quickly become more marked and grave; the fever remains stationary or increases in intensity, and there is great weakness and debility, with loss of appetite, emaciation, exhaustion and death. If gangrene sets in there is a complete stopping of the circulation throughout the organs, putrefying germs enter the parts affected, the breath of the animal becomes fetid and offensive, respirations are labored and quick. Putting the ear to the chest the so called moist rales, or death rattle, may be heard. In some cases death may be precipitated by heart failure. The respective duration of these three stages of pneumonia are: Congestion, one to three days; red hepatization, three to seven or eight days; and resolution, from seven or eight days to three weeks.

Symptoms.—There may be chills and shivers at the outset, followed by trembling of the muscles, closing up of the pores in the skin, cold and clammy extremities, and the general symptoms present in

a severe cold. This again is followed by feverishness of a more or less pronounced character, the skin is hot and burning to the touch, the temperature runs up to 105 or 106 degrees Fahrenheit. This rise in the temperature may sink considerably after the accumulated matter in the lung cells has found an outlet. The beat of the pulse is accelerated, reaching 50 to 60, full and bounding at the start, later, as a rule, weaker and more irregular. The breathing at the start is quick and labored, the nostrils visibly dilating and trembling with the inhalations and exhalations. Congestion of the mucous membrane sets in, the patient remains in a standing position until the crisis of the disease is reached, when, succumbing to exhaustion and weakness, it may lie down, turning over on the diseased side of the body. The longer it remains standing the more favorable, as a rule, are the prospects for recovery. Appetite as the affection progresses is lost, there is an enhanced feverishness and attendant thirst, and the secretive glands perform their work poorly or not at all. There is more or less costiveness, the urine attains an abnormal, highly colored appearance, and is scanty in volume. The patient continues to cough—a harsh, shallow and painful sort of cough—first dry, and in the latter stages moist. There also may be more or less nervousness, the animal being dull and listless, drooping and fidgety, sometimes amounting to delirium. On the eighth day the crisis in the majority of cases sets in. After this either death, a relapse into a still more serious condition, or recovery may take place.

Diagnosis.—The stockman can make a pretty correct diagnosis; first by taking the temperature, ranging around 104 to 106 degrees Fahrenheit; next by the expectoration and discharge, appearing often in the color of prune juice. In putting your ear to the chest or nostrils and listening to the inspiration you will hear a peculiar crackling sound, much like the one produced when you throw salt on a fire, this being what the physician calls crepitant rale. In striking or tapping the chest with your finger the sound over the diseased parts of the lungs will be dull and differentiating distinctly from that produced over the sound tissue. You remember the distinction we made between bilateral and unilateral pneumonia—bilateral being when both lungs are affected, and unilateral where only one lung, or part of one lung, is affected. Bearing this in mind, remember that acute bronchitis and acute lobar pneumonia differ in that the first is a bilateral and the latter a unilateral disease. You may also distinguish between the two by remembering that in bronchitis the expectoration is light, almost white, while in pneumonia it takes on the brownish or prune juice color. In the early stages of bronchitis the sound in the chest is low and whistling, or sibilant, extending to both sides (the so called sibilant or sonorous rales), while in pneumonia the crepitant rale sound, before described, is heard on one side of the chest only, denoting the location of the disease. In the same way, in the second stage of the respective diseases, bronchitis, when you strike or tap the chest with your finger will answer with a sonorous, resonant sound on both sides, while if the disease is pneumonia there will be a dull sound over the affected part only (one side usually). In the third stage the sound in the chest, in the case of bronchitis, will be dry and harsh, while if the patient suffers from pneumonia you have the peculiar respiratory murmur which we have heretofore described under the name of moist rales. As stated, if you take good care of the patient, pneumonia is not an exceptionally dangerous disease in the horse, and an average of eight out of every ten cases recover. Remember, however, that the recovery to a large extent depends on the general condition of the system of the animal affected. If the appetite is good and the patient continues to eat fairly well throughout the disease, it as a rule recovers, but if it will not eat, this often means that death will be the result of the attack. If the circulation is impaired the danger of the heart clot forming and dilation of the heart are also serious. Under these circumstances we cannot too emphatically recommend you to keep the animals in good condition, with digestion and circulation vigorous and unimpaired, by the constant use of Davis Stock Food, 1 tablespoonful to each feed in health, and 2 tablespoonfuls to each feed in disease. It will be the means of saving you many valuable animals.

Treatment of Acute Lobar Pneumonia.—In dealing with this malady you should, if you are not sufficiently acquainted with its symptoms and manifestations, and are not confident that you can handle it in all serious cases, call in a veterinarian and let him direct you at the beginning. It is, however, what is called a self limited disease, meaning that it will run its own course, and that no kind of medication is of very much avail. All you can do in such cases is to try to assist nature in running its course, remembering that in numerous instances animals suffering from this affection have been known to get

well without any treatment whatever, while it is undoubtedly a fact that numerous others have succumbed to too much treatment, or rather to improper treatment. We have no specific treatment for pneumonia, and all we can do is to watch the symptoms and treat them as they arise. The heart should be carefully watched, and, when palpitating and feverish, quieting drugs should be administered. Thus, if the patient is a young, full blooded animal, you will often be obliged to administer sedatives—as, for instance, tartar emetic, aconite, or veratrum—this having the looked-for, soothing, quieting effect, diminishing the number of heart beats. Tonics and stimulants, as Davis Stock Food, 2 tablespoonfuls to each feed, should be used throughout the treatment, to induce the animal to keep on eating, while pure stimulants, as whisky, alcohol, or ammonium carbonate, may be of benefit in the second stage; remembering, however, that this kind of stimulation, contrary to Davis Stock Food, is always followed by a reaction, not giving permanent strength, but only buoying up the system for a brief period at the expense of the vital force of the animal. It should therefore only be resorted to in cases of urgent need, as a momentary bracer and enlivener when the patient is very weak. Davis Stock Food, on the other hand, is not a stimulant in the proper sense of the word; it tones, invigorates and strengthens, by its well known action upon the digestive and assimilative functions, and thus leaves only permanently salutary and beneficial effects. Should the temperature of the patient run up to 104 or 105 degrees Fahrenheit, you should try to reduce it a few degrees, by using Bradbury's Brazilian Specific in accordance with the directions given with it. In order to prevent heart clots from forming, this generally resulting fatally, you should take great care to keep up and stimulate the heart's action and the general circulation, and here alcohol may be of use in an emergency, when you discover that of a sudden the heart action has become sluggish and impaired, indicating that clots are in formation. Give a good dose of pure alcohol every three or four hours after you discover the danger, and keep it up day and night until the heart once more beats strongly and regularly, indicating that the crisis is past. You may give the horse the alcohol in its drinking water, 2 ounces or so to each pail of water or part of one. If you have no attendant to watch over the sick animal at night you may place a pail full of water, containing the alcohol, in the manger, so that the stimulation may be kept up during the night. Let the diet of the patient be light and nourishing, with Davis Stock Food religiously added to each feed; keep up with the use of Bradbury's Brazilian Specific until all symptoms of fever abate. Remember also that the weakness and fever, with ensuing restiveness and exhaustion, increase in the evening, culminating in intensity after midnight, for the reason of which, if heart failure and death are to be guarded against and avoided, it is of the greatest importance that stimulation be kept up during these dangerous hours. Remember that the vitality in the sick animal is strongest between the hours of 8 a.m. and 12 m., and weakest between 2 a.m. and 6 a.m. Among the best heart tonics, if rightly administered, are strychnine and nux vomica. Coax the patient to drink four, five or six times a day, drinking a small quantity of water each time, and you may with beneficial effect add potassium nitrate to the water. Tartar emetic, 5 to 10 grains, is sometimes of great assistance. Always keep in mind the importance of a correct diet during the disease. It is by the appetite or lack of appetite present that we are able to formulate a fair idea of the affection, its scope and gravity, whether it means recovery or death. Look after the feeding of the patient yourself, if possible. Examine the manger, see that it is kept clean and sweet, free from foreign substances and all ferment or impurity; wash it yourself, or have it washed out while you look at it. Then take a clean pail and make a mash of steamed oats, bran, etc. (succulent feeds are good), add 2 tablespoonfuls of Davis Stock Food, and watch the animal to see how it eats it. You should feed only small quantities at a time—divide the ration into four or five feeds a day. You may make up the feed of layers of bran and more sparingly of oats, 1 tablespoonful of Davis Stock Food into each before combining them in this way. Steamed oats with Davis Stock Food alone may be given, if you cannot induce the horse to eat anything else. Carrots, grass, apples and the like are good for the sick animal. Coax it to eat; do not let it shirk its feed, for upon its strength and vitality being kept up in this way depends the outcome of the affection—recovery or death.

L o b u l a r Pneumonia.

This may in popular language be defined as an inflammation of the bronchial tubes and air cells, forming what is known as a pulmonary lobule.

Causes.—As a rule this is a secondary disease, being complicated with or following glanders, purpura hemorrhagica, pyemia, etc. It is caused as a rule

by clots forming in the capillaries of the lung artery, blocking them up and interfering with or stopping the circulation altogether.

Symptoms.—In the majority of cases you will find the symptoms similar to those peculiar to acute bronchitis, but extending so as to involve the air cells of the lungs. The temperature rises rapidly, breathing is hurried and labored, and soon a short, suppressed, painful cough sets in. It is a slow running affection, and may result in either a chronically congested state of the lungs or in death.

Treatment.—Let the diet be light and nourishing, akin to that recommended for acute lobar pneumonia, and always give Davis Stock Food, 2 tablespoonfuls to each feed, with the ration. In case of weak heart action, or other forms of great exhaustion and debility, you may, as in the other form of the disease, administer alcohol in the drinking water. When fever ensues use Bradbury's Brazilian Specific. Keep the patient quiet and comfortable, and coax it to eat.

Chronic Interstitial Pneumonia.

This is a chronic inflammation of the lung tissue, or, more properly speaking, the soft web or tissue surrounding the air cells. This web is enlarged by the disease, compressing the tissue proper, and thus interfering with the circulation and healthy functioning of the organs. We also call the disease chronic pneumonia or cirrhosis of the lungs.

Causes.—It is a secondary disease, following pneumonia or pleurisy, or certain forms of bronchitis.

Symptoms.—The symptoms vary somewhat, depending upon the nature of the primary disease. If it was pneumonia, dullness or percussion will remain in the organs after the other symptoms have disappeared. The murmur produced by the act of breathing is different from that in a healthy animal, often being almost inaudible; or, if it is secondary to bronchial affections, the sound produced by the respiratory function may be cavernous or amphoric in character. The side of the body which is affected sinks in and is dull and dead to the touch. If the animal is in any way exerted, breathing becomes labored, and there may be coughing and other signs of distress.

Treatment.—You must try to build up the general strength and vigor of the patient by systematic feeding and care. Let the diet be wholesome, nourishing and rather liberal, always adding 2 tablespoonfuls of Davis Stock Food to each feed; and at the same time do not overwork the animal in any way. Give him moderate exercise, fresh air and rest, and you will be able to build him up gradually for future usefulness. When Davis Stock Food is used no other treatment is required.

Heaves,

or broken wind, a disease which is technically known as pulmonary emphysema, is a chronic disease of the lungs, either a dilation or rupture of the substance known as the vesicular structure being present. You may distinguish it by the dry, abortive cough, and the peculiar double act of expiration, giving to it the name of broken wind. We divide the affection into two forms, the vesicular and the interlobular; the vesicular indicating a dilation of certain parts of the lung webs or structure, while the other points out a rupture in the walls of the air cells, which permits the air to escape into the connective web or tissue that bridges and knits the cells to each other. Thus the inhaled air leaves its usual confinement in the tubes and cells, and invades the surrounding tissues and spaces.

Causes.—Overwork or exertion of any kind, especially if the animal is run down in condition or debilitated from disease, may produce it. Or in some cases there may have been an inherited predisposition to the ailment, the walls and cells of the lungs being originally weak. If you drive a horse for some distance at the top of his speed, and he, being a willing animal, overdoes himself in his effort to accommodate you, then the air in the lungs is apt to dilate the cells to the bursting point, and rupture occurs. In heavy muscular work, such as drawing a heavy load, the inhaling of air is deep and strong, the air becomes heated, and the walls of the air cells are stretched and dilated beyond their capacity. This kind of rupture in the lungs may also be produced by coughing; but the cough must be hard and prolonged to cause so serious an injury to the lungs. Again, certain changes taking place in the system, or perhaps the irritation produced by the feeding of dusty, dirty hay, and the like, are apt to cause it. Or you will frequently find it following such diseases as pleurisy, pneumonia, bronchitis, etc.

Symptoms.—The rupture in the lungs is sudden, although the affection may have reached this crisis in progressive stages. It is not difficult to detect the nature of the disorder once it has culminated in a rupture. There is a marked and distinct change in the act of expiration or exhalation. In health

the act of breathing covers first the inhaling of the air, next the exhaling, and then there is a short pause. If the disease of which we are treating, however, is present, you will find that in the midst of the expiratory or exhaling act there is an abrupt pause, and then a secondary expiration of air. You will also find a well marked groove, produced by the muscles which run along the abdominal organs, denoting the condition. The double movement in the act of exhaling is not, however, due primarily and entirely to the presence of heaves, but is a symptom common in all cases of rupture of any part of the diaphragm, hernia of the bowels or pleurisy, and is especially pronounced as the time of death draws near. In the act of inspiration or inhalation of air the ribs elevate and seem to turn on their axis, and it is as though their posterior border turns upward and outward; then, at the end of the following expiration, there may be something akin to a jump or jolt in the region of the belly, as though the intestines were jerked back into the cavity. So severe may this be that if any movement of the bowels of the patient is produced, or if the animal is hitched to a rig or any other kind of light vehicle, it will visibly move. The nostrils may open wide and keep in a dilated condition, the anus in some cases may go back and forth with the disordered process of breathing. Or there may be marked flatulency or breaking of wind. The cough accompanying the disorder may in some instances be harsh, dry and abortive; usually it may be called a suppressed, dry, painful, abortive sort of a cough.

Treatment.—No kind of treatment or appliance has as yet been found of much avail in this disorder, and all the more serious cases are incurable. However, in milder attacks, proper care and special feeding, adding 2 tablespoonfuls of Davis Stock Food to each feed, and allowing a nourishing, wholesome, strengthening ration, the patient may be restored to some measure of health and usefulness. First you should give a good dose of physic, a purging ball of aloes. This will relieve the costiveness of the bowels, the flatulence, catarrh of the intestines, indigestion, etc., that attend this disease, and by the use of Davis Stock Food you may make the relief gained lasting. Do not feed dusty hay, and if you feed hay at all dampen it with water to which is added a weak solution of salt. You may also with advantage wet the oat feed. The medicinal agent recommended for the affection is arsenic, but you had better call in a veterinarian and let him show you how to administer it. Or, if the case is a mild one, you may simply give 1 ounce of Fowler's solution thrice daily. This is an arsenical remedy, and will bring relief in milder cases. Above all, you should make it a point to use Davis Stock Food regularly, 2 tablespoonfuls to each feed. This, with a careful diet, adapted to the need of each special case, will often prove all the treatment needed to pull the patient through.

DISEASES OF THE PLEURA.

Pleurisy.

The pleura is the serous membrane that invests the lungs, and pleurisy denotes an inflammation of this membrane. We divide the disease into a number of forms, as follows: Acute, subacute, suppurative, and interstitial. Among these we find that the dog is the greatest sufferer from acute or plastic pleurisy, while the disease in the horse mostly appears in the subacute form, being an inflammatory process with a large quantity of serum. By suppurative pleurisy we mean the variation of the affection in which pus cells form in the organs; and interstitial or adhesive pleurisy, known also as chronic pleurisy, indicates a diseased condition of the parts in the course of which new connective tissue formation goes on in the lungs.

Causes.—Traumatic injuries, as, for instance, wound penetrating the muscles in the intercostal spaces, are often responsible; while in many cases it may be a secondary affection, complicated with or following other diseases of the respiratory organs, as, for instance, pneumonia, when we call it pleuropneumonia; or it may be due to diseases of the blood, as, for instance, glanders, or by foreign substances gaining entrance to the pleural sac, as pus, blood or air. As a rule it is a secondary disease. It is frequently seen in young, green horses, put up in the dealer's stable, and it is one of the most widespread and dangerous diseases affecting the equine family. It is said that horse dealers sustain greater losses from this malady than from any other affection of the horse. It is claimed by latter day investigators that a germ or micro-organism is responsible for its existence.

Symptoms.—It is not very easy to definitely diagnose the affection, and it is a fact that while we are treating for other diseases of the lungs and breathing organs this affection may be coming on without our being aware of it at all. Pneumonia is one of the diseases with which it most generally is associated, or which it most often follows. It is preceded by a chill and slight fever, and the patient looks listless, dull and exhausted, the muscles tremble visibly, the hair is rough and staring, the skin is cold and clammy, and the fever increases. Next the hair may fall down in a lifeless way, the body warms up, the pulse, which at the beginning of the disease was hard and rapid, gradually becomes softer and weaker. At the outset the temperature may have run up to 104, 105 or 106 degrees Fahrenheit, but with the following effusion, characteristic of the affection, the temperature falls, and often goes down to a very low point; today you may find it at 101, tomorrow at 102 degrees Fahrenheit, and then there is a sudden fall. The patient breathes in a labored, hurried way; he moves as though made of one piece, in a stiff, cumbersome, peculiar manner. Now and again he gives voice to a subdued grunt, denoting pain attending his efforts to keep moving about. This is exceptionally enhanced if you turn him around sharply. There is a low, suppressed, painful cough, and appetite and spirits are lost. As the effusion from the membranes increases, the breathing becomes more and more labored and the patient may succumb to general debility and nervous and physical exhaustion.

Diagnosis.—If you have studied the subject enough to be able to distinguish between the characteristic states of the pulse in disease, you will be able to diagnose pleurisy by the wiry nature of the pulse. You will also observe the breathing from the abdomen or stomach, and the presence of the double act of inhalation previously described. The oscillating, rising and falling temperature is another evidence of the disease from which you may draw your deductions; and, still, it may take a professional man to distinguish between pleurisy proper and pneumonia. The disease is a serious one and many of the animals affected by it die from debility and exhaustion. If the appetite continues good, and the fever keeps within reasonable bounds, with a good condition and strong heart to resist the inroads of the affection, there are, however, good hopes for the patient.

Treatment.—The pain is considerable in the primary stage of the affection, and your aim should be to combat and overcome this, while later, in the second stage, checking of the effusion should be attempted. Quieting, soothing anodynes and sedatives are recommended, such as morphine and aconite combined, but it should be administered by a skilled veterinarian if the case is at all serious—and you will do well under these circumstances to call one without delay. If the patient is weak and exhausted, stimulants, as alcohol, whisky or quinine, should be administered, and you may give them in the drinking water, about 2 ounces of alcohol to a pail of water. Always allow the patient 2 heaping tablespoonfuls of Davis Stock Food to each meal, to counteract the tendency to weakness and exhaustion and keep the digestive and assimilative functions in order. This is all important if the animal is to be saved. Do not allow him to lose his strength if it can be helped. To check the effusion, stimulate the kidneys to action, administering half or ounce doses of nitrate of potassium. Iodide of potassium is also good for this condition. Bradbury's Brazilian Specific will in the majority of cases prove itself an excellent remedy for this condition, and you will do well to give it a trial. Remember that iodide of potassium causes the patient to lose its appetite, and for this reason its use, if at all, should not be kept up long. Among the remedies prescribed by the veterinarian will probably be included arsenic and nux vomica, both of great assistance under special conditions and symptoms. To keep up a healthy appetite and digestion Davis Stock Food, as always, will be found the remedy par excellence, and, as we said above, if you are in need of an immediate stimulant to combat and overcome sudden spells of weakness and exhaustion, pure whisky or alcohol are the simplest and best. Administer in the drinking water, as directed. Treating locally, mustard, acting as a counter irritant, may be used with good results. The oil silk jacket which we recommended and described in a previous chapter also may be of assistance. In order to make it effective, the hair should be cut short over the spot on which you apply the blister. If some suppuration should ensue after the application of mustard, the skin falling off in spots, and leaving prominent scars at times, do not let this deter you in availing yourself of the relief the blister will give, remembering that this is preferable to losing a valuable animal. Careful attention should be given to the diet, and the appetite should by all means be kept up. Keep the patient quiet and comfortable, and give him plenty of succulent feed, grass, gruel, apples, carrots, and so on, if you cannot induce him to eat steamed oats or bran.

Supplement the feed with Davis Stock Food, as usual, 2 tablespoonfuls to each feed (the regular and universal dose of Davis Stock Food is 1 tablespoonful to each feed, in health, and 2 tablespoonfuls to each feed, in disease, for the grown horse; the foal and growing colt about one-half the quantity). It stimulates the action of the salivary glands, aids the digestion, increases the assimilation, and is indispensable in this disease if a speedy recovery is to be secured.

Purulent Pleurisy

is a special form of the disease just treated, and indicates a condition in which the pleural cavity becomes filled with pus like matter. Injuries to the chest cavity, causing pressure, abrasion or wounds which involve the pleura, may bring it about. The technical name for the affection is empyema.

Hydrothorax.

When we find the pleural cavity filled with water or serum, the condition is known as hydrothorax. It is not a common disease in the horse, sheep and dogs being the principal sufferers from this disorder, and we shall therefore only

give passing notice to it, outlining a simple treatment if it should happen to occur among your stock.

Treatment.—Your object should be the building up of the constitution of the patient by careful feeding. Davis Stock Food regularly used with the ration will materially help to improve it. As a local counter irritant, use Davis Veterinary Liniment, or any other good blister, and if fever accompanies the affection resort to Bradbury's Brazilian Specific.

Pneumothorax.

This denotes a condition when air invades and accumulates in the pleural cavity, some hurt or pressure which has produced abrasions or broken ribs, etc., being to blame. Rupture of the air cells or gangrene of the lungs are other causes. It

properly comes under the heading of pulmonary emphysema, under which these conditions are treated.

Pneumo- nokosisis

is a condition of the lung tissue brought about by the inhaling of smoke, dirt or dust, this discoloring the lung substance. Animals exposed to an atmosphere loaded with coal, stone or metallic dust are especially liable to contract this affection, but it is not very dangerous, and with the removal of the cause, or

changing of the animal to a fresher stratum of air, the condition as a rule corrects itself. In taking leave of this subject, let us add, that for all the last named affections or disorders, coming under the general heading of diseases of the lungs, change of air, hygiene, sanitation, careful diet, always including Davis Stock Food with the ration, good drinking water and plenty of green, succulent forage, will as a rule be all that is necessary in the way of treatment. And it is a fact that, if such precautions were always observed, in health as well as in disease, it would decrease the general tendency to disease in your stock 50 per cent. Keep the digestion, assimilation and circulation of your horses in good order by the use of Davis Stock Food, and increased health, vigor and strength of your horse with resulting greater resistance against the inroads of disease, will be your reward.

THE DIGESTIVE ORGANS.

Lampas.

Lampas is indicated by a swollen and in some instances inflamed condition of the membrane of the palate. In the course of the affection the membrane will swell up and become so large as to protrude beyond the front teeth or incisors.

It is generally found when an examination is made on the appearance of such symptoms that they are of a secondary nature and that some other disease of the lungs or throat is responsible for the attack. It has also been shown that in a number of cases the swelling of the gums simply indicates a faulty stomach, dyspepsia, or some other derangement of the digestive functions.

Treatment.—You may have heard of or probably even yourself made use of the old treatment, consisting in applying a red hot iron to the diseased membrane. If you have made use of it you know that the operation caused a slough, which in turn left a wound that often seriously interfered with the use of the teeth and taking of feed. It is therefore not to be recommended, and we advise you to avoid it. Do not use it in any case. All you need to do is to apply a soothing, antiseptic wash, such as a 2 per cent solution of Phenalin, to the affected membrane, feeding the animal on soft, easily masticated

feed, and let the disease run its course. The animal while the disease lasts will chew with the other side of the mouth, and thus will be quite able to hold its own. Should some disorder of the stomach, indigestion or dyspepsia, be the primary cause, you should aim at overcoming this. Lampas, except during the period of dentition in the foal, should cause the horse owner but little concern, and, if he uses the Phenalin wash twice a day, and as soon as the worst pain attendant upon the affection seems to be past endeavors to wear down the swelling by feeding solid foods, as carrots or corn on the cob, no other treatment is necessary. The horse is fond of eating corn on the cob, and even if his mouth is sore he cannot refrain from partaking of this delicacy if it is offered to him. Add Davis Stock Food to the regular day's ration in order to overcome all sluggishness and tendency to indigestion that may exist in the stomach and intestines.

Parrot Mouth.

When the upper jaw and front teeth are long and protrude over the lower, the affection is called parrot mouth. It is an abnormal condition, which prevents the teeth closing on each other in the ordinary way, and at times it makes it hard for the animal so affected to grasp and cut its feed with the teeth, this being especially so in the grazing season, when the horse is turned out to provide for himself. If the case is at all pronounced you will do well to assist him now and then, by once a day feeding him on hay or grass cut fine, or allowing him a feed of grain, in both instances adding Davis Stock Food, 1 tablespoonful to each feed. This will soon put the horse in first class condition, while before—due to the malformation of his mouth—he may have been rather backward and unthrifty looking for the want of proper quantity of nourishment.

Cribbing

is an affection well known to all horse owners, and consists in the animal gnawing away on some convenient substance, preferably wood, while stalled, this gradually producing a wearing away of the front portions of the upper and lower incisors, (front teeth). Popularly we call the affection crib biting, and the animal is referred to as a cribber.

Causes.—It is often a mere habit, contracted by idleness, the horse being left to stand in the stall unoccupied for days or weeks, perhaps, trying to find something to do to pass the time away. However, it also may be caused by the lack of some substance in the system, or by some affection of the stomach, and often it will be found to diminish and cure itself with the regular addition of Davis Stock Food to the feed ration, this relieving whatever tendency to indigestion may exist in the organs. In the case of a chronic cribber you should keep him in a stall in which no manger is found, and with no woodwork or anything else that might afford him gnawing material within the reach of his head. It is well always to keep a supply of rock salt in the stall by the horse, but, if you find that this increases the habit of cribbing, remove it.

Wind Sucking.

This is a peculiar affection, probably due to some derangement of the nervous system, and evidencing itself by the horse grabbing hold of some hard substance with its front teeth, grunting, arching the neck, and assuming an attitude as if he swallowed a quantity of air. In other cases he may pucker his lips, put his nose into the air, and imbibe wind without bringing the teeth into use at all. The two phenomena, cribbing and wind sucking, seem to be allied in many respects, and it is probable that some nervous disorder or other obscure affection is responsible for both.

Treatment.—Not much is to be done. Some farmers advocate the application of a wide strap around the neck in such a way that the animal is prevented from arching it, but, on account of the danger of choking or strangling to which it exposes the patient, we do not recommend it. Give the animal plenty of exercise, feed him well, allowing Davis Stock Food with each feed, give him plenty of fresh air and fresh water, and the condition may correct itself.

Irregular Teeth.

Should the molar teeth of the horse for any reason be uneven, the sharp points projecting outside the jaws, you may file down these roughened edges or cut them off. You should, however, not attempt to symmetrize or smooth the remainder of the teeth, as it is natural for them to be sharply pointed and rough, to enable the animal to thoroughly masticate its feed.

Stomatitis.

This name is given to the condition at times met with in the horse when the inflamed membrane causes the saliva to run or drip from the mouth. If you examine the membrane of the mouth you will find it reddened, swollen, first dry, afterward secreting a fluid, which, together with the saliva, may flow from the mouth.

Causes.—Irregular teeth, injuries to the palate or other parts of the mouth, irritating drugs or drenches administered in disease, feed lodging in a hollow tooth and decaying, etc.

Symptoms.—The membrane of the mouth and lips presents a swollen appearance, ropy saliva may drop from the mouth, appetite is poor, the functions of prehension and mastication are interfered with.

Treatment.—You may give a 1 per cent solution of Phenalin as a gargle, syringing it into the mouth; or, if you have not this remedy on hand, substitute with chlorate of potash, which also should be given as a gargle. You can also with advantage use the Phenalin solution as a wash for the mouth and sore places. You may also administer potassium nitrate, $\frac{1}{2}$ ounce at a dose, in the drinking water, this being soothing and cooling to the affected membrane and palate. The trouble in the horse is not a serious one, and, as a great number of blood vessels center in this region, it will correct itself with but little treatment. Let the diet consist of soft feed principally, adding Davis Stock Food to the ration.

Glossitis.

This is an affection of the tongue, interfering with the duties assigned by nature to this organ. The condition of the tongue is akin to that encountered in stomatitis. In both instances it is a case of mild inflammation, and is not especially dangerous in the horse.

Causes.—Injuries of the tongue, scalding, irritation of any kind, as in the case of stomatitis, of which it in the majority of cases is a complication, may be responsible. The young animals, partaking of the succulent, dew wet, early spring grass in the morning, are especially liable to be affected, but it does them no great injury. The symptoms resemble those of stomatitis, with the exception that the tongue often protrudes from the mouth, and its tip is sometimes so dark as to be almost chocolate colored.

Treatment.—A wash of Phenalin, properly diluted with water. Go about it in the same manner as advised in the case of stomatitis. Let the ration be wholesome and nourishing, its substance soft and easy to masticate while the affection remains. Add Davis Stock Food regularly to the ration.

Aphthae or Thrush of the Mouth.

This is what is commonly called thrush, and consists in another form of inflammation of the mouth, caused by a parasite of vegetable origin, technically named *oidium albicans*. Young animals, foals, calves, lambs, pups, etc., are especially liable to contract it.

Symptoms.—There is an inflammation of the membrane of the mouth, it being dotted with minute white spots, which soon develop into vesicles, which in turn rupture and liberate a slightly purulent liquid. It is not a dangerous disease, and not difficult to remedy.

Treatment.—Observe strict sanitation and hygiene about the stable, and, as in the other instances of mouth diseases already mentioned, make the feed soft and easily masticated while the affection runs its course. Use the Phenalin wash in the same way as recommended for the two foregoing affections. Give a small quantity of potassium nitrate in the drinking water, and 1 tablespoonful of Davis Stock Food in each feed.

Parotitis

is the disease which in the human being is called the mumps, and consists in an inflammation of the parotid gland near the ear. Fever and swelling accompany it and constitute its symptoms.

Causes.—It is a disease which is generally of parasitic or germ origin, but may be the result of local injuries, exposure to inclement weather, etc., this aiding in its development. As stated, it is marked by the swelling of the gland, which becomes painful to the touch, and while the affection lasts there is feverishness and restiveness, and, at times, difficulty in swallowing. The patient may persist in turning its head to the side.

Treatment.—This should be made up of soothing, absorbing ointments and liniments, such as Davis Veterinary Liniment. Davis Veterinary Blister, properly applied, according to the directions given with it, is also excellent. If suppuration should ensue you may resort to hot poultices, opening the abscess when the pus has formed, and removing it carefully. For internal use, relief of the fever and nervousness, administer cooling, soothing drinks and antiseptics. Davis Distemper Cure will be found of much assistance in this connection.

Pharyngitis.

This may be described as an affection of the inner lining of the throat, or pharynx, the membrane being swelled and inflamed and swallowing often attended with considerable difficulty.

Causes.—The patient of a sudden seems to have lost its appetite and refuses to partake of any feed, especially solids. On closer observation the patient may be seen to make attempts to swallow at intervals, but unable to do so. This is attended with a feverish condition, although the temperature as a rule does not run very high, remaining around 101 and 102 degrees Fahrenheit. Generally the affection runs its course without any cough being present, unless it should be complicated with laryngitis, or feed or other substances should cause irritation to the throat. A symptom peculiar to the affection is that the feed often is seen to return through the nose on the animal's being unable to swallow it. In the same way, if you should place a pail of cold water before the patient, he will bend down and take a few swallows of it, then raise his head, keep it in the mouth for a few moments, and regurgitate it through the nose. This is caused by the inability to swallow, in the worst stages of the disease returning everything—water, feed, mucus and pus—from the affected pharynx through the nostrils. As a rule the animal will recover, unless death from starvation or paralysis should ensue.

Treatment.—Apply a light application of Davis Veterinary Blister, or, for want of this, any other good blister, over the regions of the parotid gland and pharynx (throat). Twice a day or so use the Phenalin solution as a wash, or, if you should not have this on hand, spray or swab out the throat with a solution of silver nitrate or peroxide of hydrogen, anodyne, etc. Do not try to give solid medicines, and never drench. Give the patient a moderate quantity, say 1 ounce, of chlorate of potassium, in the drinking water; this will be of assistance even though he should be able to swallow but little of it at a time. In coming in contact with the inflamed part of the throat it has a soothing, cooling effect on the tender, swelled surface that cannot be otherwise than beneficial. You should separate the patient from the other horses, and be careful about the pail you use in watering it, and the manger from which it eats, and which it often wets and soils with saliva. Better keep it and all vessels and utensils used in feeding and watering it entirely apart from the other animals. If the bowels should be constipated, or indigestion present, you may resort to an enema or purge to relieve them. Apply Davis Distemper Cure to the tongue every two hours.

Paralysis of the Pharynx

may be defined as a weakening or relaxation of the throat muscles, often carrying with it complete paralysis of the parts and inability to perform the function of swallowing.

Causes.—It may be secondary to some other disease of the throat, as, for instance, pharyngitis, and is met with as a complication of cerebrospinal meningitis. In other cases it is impossible to trace the affection to any direct cause.

Symptoms.—A complete loss of the power to swallow, and in attempting to feed the patient both solids and liquids will be returned through the nose or mouth. The healthy elasticity, with contraction and expansion of the parts, is lost, and the throat muscles are dead and flabby to the touch. It is a serious disease, and death from starvation and exhaustion as a rule takes place in the course of five or six days, or less.

Treatment.—Call a veterinarian. Belladonna or strychnine, administered according to the veterinarian's directions, will be of assistance. Locally light applications of Davis Veterinary Blister, applied over the larynx, and an antiseptic astringent wash, as a Phenalin solution, applied directly to the pharynx, etc., will help. From time to time, in a gentle, coaxing way, try to make the patient eat a little, using very light, almost fluid feedstuffs, adding Davis Stock Food, about 1 tablespoonful to each feed.

Pharyngeal Abscess.

This name indicates a swelling of the tissue of certain parts of the inside of the throat (pharynx), forming pus and suppuration. It is a comparatively rare affection, and if it does occur it will generally be associated with roaring, without your being aware that this condition is an outcome of the former. In the progress of the inflammation the abscess breaks, and you may then know that the disease is present from the discharge of pus from the nostrils of the patient.

Treatment.—If possible, you may puncture the swelling at the proper time, when the pus has formed within it, but this is not always easy, except where the abscess is prominent and bulging. If you discover the affection, but are unable to reach and puncture it, simply treat it with an antiseptic solution of Phenalin, used as a throat wash. At times you may be able to open it by simply boring into it with your forefinger, using one of the ordinary devices for keeping the animal's mouth open under the operation.

Pus Formation in the Guttural Pouches

may be described simply as an inflammation of the membrane of the pouches located in the throat (gutturals), followed by the formation of pus and suppuration. It resembles and is related to catarrh, and with the breaking of the swelling the suppurating pus will be discharged from the nose.

Causes.—It is generally a secondary affection, resulting from some previous disease of the throat and surrounding organs. Sometimes it clogs and closes up the so called eustachian tube, this making it impossible for the accumulating pus to find an outlet, causing its collection in the parts, with swelling and difficult breathing, roaring, and direct interference with the act of swallowing. If relief is not forthcoming the swelling may continue to increase until it bursts open; at other times the purulent matter collected may cause gangrene of the lungs, or it may strangle and suffocate the animal. In the majority of cases the pus finds an outlet through the nose. The discharge is thick, slightly sticky, and creamy in color, devoid of odor and not apt to form solids or crusts. The flow of this matter is intermittent, and may be considerably increased by the patient bending its head low, masticating its feed, swallowing, or other acts causing exercise of the parts. It is a serious affection, slow in its course, and death from gangrene of the lungs or asphyxiation may result.

Treatment.—Call in a veterinarian and let him do the prescribing and treatment at the beginning. On account of the interference with breathing and swallowing he probably will resort to opening the swellings. This operation you should not yourself try to perform for fear of cutting one or more of the numerous blood vessels abounding in this region of the system. Sometimes, in the graver cases, the veterinarian may have to resort to the operation called hyovertebrotomy, one of the finest and most delicate pieces of surgery performed on animals. It may be superficially described as consisting in making an incision above and one below—passing a seton through from one to the other. This, of course, can only be done by an expert. You should give the patient his grain feed in a pail or crib and his hay before him on the floor, making it necessary for him to lower his head in eating, which will cause the pus to be liberated and flow out in greater quantity. If possible turn him out in the pasture to graze; exercise him moderately, and keep pails, cribs, manger and all utensils employed in his care scrupulously clean and sweet, washing them every day with hot water and Phenalin.

DISEASES OF THE ESOPHAGUS (GULLET.)

Lodging of Foreign Substances in the Gullet—Choking. Any foreign substance of a hard and solid nature which becomes lodged or imbedded in the canal of the gullet may cause choking and strangulation. Potatoes, apples, carrots, turnips, or other solid feeds, not thoroughly masticated, or which have not been properly moistened by the saliva of the mouth, are likely to become thus arrested on their way to the stomach. For convenience we divide the gullet into three parts, the pharyngeal, cervical, and thoracic (throat, neck, and chest), respectively, and the obstruction may locate in any of these positions. In the horse we find that it generally locates in the cervical portion of the organ.

Symptoms.—If the substance is located in the pharyngeal portion of the gullet, you will find it associated with an involuntary contraction of the neck muscles. The animal is distressed and uneasy, it salivates, and the saliva is often found to be a thick, ropy, gluish matter, indicating irritation of the mucous glands of the surrounding parts. The swelling often is pronounced, and in thrusting your fingers down into the throat you may encounter the foreign substance lodged there. In cases where the obstructing substance has become lodged in the cervical portion of the gullet the symptoms are more obscure, although at times there is a distinct swelling on the neck along the esophagus. You may

ascertain the presence of the foreign substance in the canal by pouring water into the throat, this running down as far as the obstruction, and then returning to be expelled through the nose and mouth. Lastly, when the substance is lodged in the thoracic portion of the canal, the only symptom to denote its existence is that the animal of a sudden seems to lose his appetite, and when he attempts to eat or drink he is unable to swallow the feed and water, and it is subsequently regurgitated and expelled through the nose and mouth.

Treatment.—You should try to extract or move down the obstructing substance lodged in the throat or chest by external or internal manipulation, as may seem most advisable. Should the substance have become lodged farther down you should lubricate both the passage and it, if you can reach it. If located in the thoracic portion of the chest, it may be necessary for you to call in a veterinarian and have him remove it with a probang. In some cases it may be necessary for him to resort to an operation.

Stricture of the Esophagus

is a condition indicated by the narrowing or constriction of some part of the gullet, no matter what the reason may be. It is accompanied by symptoms of choking or strangling, due to the pressure on the windpipe.

Causes.—An injury, deposits of any kind in the canal, or tumors, may be responsible for its appearance. Or there may be ulceration or cancer of the gullet, or parasites which have taken up their residence in the passage, producing the condition. The patient, as a rule, is unable to swallow its feed and drink, which is regurgitated and expelled in the usual way through the nose or mouth. The affection, which is also called strictura, may be visible externally when the animal attempts to drink.

Treatment.—If the affection is not too severe, the patient being able to partake of feed and drink, careful feeding on soft, easily swallowed feed, always including 1 tablespoonful of Davis Stock Food to each feed, will be all the treatment necessary. But if the disorder be a severe one, with the patient losing in flesh and strength on account of its being unable to swallow the proper amount of feed, it may be necessary to call in a veterinarian and have him cut down the stricture, and in the worst cases, where a considerable portion of the gullet is all but closed up, no other recourse than destruction of the animal is left open.

Dilatation of the Esophagus

consists in a sort of rupture or hernia of the gullet, with considerable dilation.

Symptoms.—You may diagnose it by the impairment of the appetite, the apparent difficulty in swallowing, with symptoms of strangling or choking; the saliva may run or drip from the mouth, and there may be emaciation and debility. A tumor may make its appearance externally, generally on the left side, a soft, compressible swelling, which is not very painful to the touch. This swelling becomes larger after eating and drinking, and plainly visible, even to the superficial observer.

Treatment.—The only thing you can do is to call in a good veterinarian and let him operate if he thinks it advisable. In milder cases manipulation and gentle and prolonged pressure may be beneficial. Davis Stock Food given regularly with the feed will materially assist the animal to keep in condition in spite of this disorder of the gullet, by insuring a first class digestion and assimilation.

Rupture of the Esophagus.

This name is meant to indicate a piercing or perforation of the gullet by foreign substances, operations, punctured wounds, etc. Certain disorders of the brain are said to produce it.

Symptoms.—These are very similar to the symptoms present in the foregoing diseases. There is more or less choking and strangling, and after eating and drinking a large external swelling may appear. The regurgitation or expellation of the feed and water through the nose and mouth is also a symptom in the more severe cases.

Treatment.—You should not resort to any kind of treatment; in fact, none is of any avail, except where the wound is but a slight one, when you may treat it with astringent and antiseptic solutions, as you would any ordinary abrasion or injury. It will be well for you to call in a veterinarian if you find that one of your horses suffers from this affection, and let him advise you as to the best course to pursue.

Paralysis of the Esophagus

indicates a state where for some reason or other the muscular structure of the gullet has lost its pliability and contractive power.

DISEASES OF THE STOMACH.

Gastritis.

We divide this very common disease of the stomach into three forms, called toxic gastritis, acute gastritis, and chronic gastritis, respectively.

Toxic Gastritis

indicates a state where the membrane of the stomach is affected with an acute and violent inflammation; tissue of the organ being injured and lost. The membrane is red and swollen, ulcerated and eroded over more or less extended surfaces, with more or less injury and destruction to the gastric glands. Even the membrane of the mouth may become inflamed to some extent.

Causes.—Poisons in some form taken into the stomach, more generally in the form of medicine, especially corrosives and irritants, as, for instance, mercury, mineral acids, turpentine, arsenic, etc., are responsible.

Symptoms.—As soon as the poisonous substances have entered the stomach the symptoms will begin to appear. The animal will become uneasy, there will be signs of colic, it will crouch or throw itself down, and nervously turn its head around as if trying to look at or examine the stomach. The pulse, which at the beginning was strong and rapid, gradually weakens, the breathing is slow and labored, and the temperature runs up to 104, 105 or 106 degrees Fahrenheit. There is a great thirst, and the patient refuses to eat; diarrhea also may set in in some cases. Then, if the case is a very serious one, there will be signs of exhaustion and collapse as it progresses, and the patient may die from weakness and debility.

Treatment.—Call in a skilled veterinarian and follow his directions. Or, if he should not be conveniently near at hand, you may yourself prepare flaxseed tea or a solution of gum arabic and administer this to the patient. This will serve to give a soothing, mucilaginous coating to the stomach, and will be of great benefit. The colicky pains should be assuaged with opium; say 2 drams of gum opium, and this dose should be repeated several times, or until it has produced the desired effect. Give Bradbury's Brazilian Specific as directed, and in the majority of cases little else will be necessary. You must be careful not to give an overdose of opium; the 2 drams administered two or three times in succession (if necessary) will do no harm, opium being what physicians call a symptom medicine, which may often be used in considerable quantity without poisoning the patient. In order to more permanently lessen the pain you may use belladonna. The last may be given together with the opium. It is better for you to leave the treatment in the hands of a good veterinarian if the case is at all serious; and you should also remember that if you know the nature of the poison which has entered the stomach and caused the disease an antidote should be given.

Acute Gastritis

is an inflammation of the membrane of the stomach, which is also called gastric fever, or acute dyspepsia. There is a swelling and thickening of certain parts of the membrane, and it appears red and inflamed under the thick mucus which covers it.

Causes.—It is generally brought about by incorrect feeding, also through feeding at irregular intervals, or an abrupt change in the diet. If you permit your horse to drink copiously of ice cold water while he is hot and perspiring, or if he, being very hungry, gulps down his feed too fast, this may produce it. This is a disease which yields readily to Davis Stock Food, regularly used, stimulating as it does the salivary and digestive glands to activity, gradually bringing about a perfect digestion and assimilation. The disease is often secondary to or associated with affections of the lungs and liver.

Symptoms.—The appetite is impaired, and the breath has a sour, stale smell; the membrane of the mouth is dry in the first stage, after which it is covered with a gluish, ropy mucus. The patient appears dull and listless and yawns frequently, an irritation to the pneumogastric nerve causing this symptom. It is claimed by some investigators that white hellebore entering the stomach of a horse

will cause it to vomit without injuring the stomach membrane or gastric glands. As indicated, colic and diarrhea are often symptoms in this affection. The patient as a rule passes the feces at short intervals, and after these follows a thin, yellowish fluid which runs down over the hind parts, legs and tail, giving them a soiled, bedraggled appearance. The fever accompanying the affection is not considerable, the temperature remaining around 101 or 102 degrees Fahrenheit. The patient may show signs of jaundice, due to the poison's interaction on the liver and bile, and there may be more or less perspiration, languor, lassitude and stupidity manifested on the part of the animal. With prompt and careful treatment the majority of cases will recover, although, if an animal is in very poor condition, or else old and worn out, it may succumb to the disease. If neglected too long the disease also may become chronic in its nature.

Treatment.—Take the very best care of the sick horse, as soon as you have found out that it suffers from this disease. Proper sanitation, hygiene and nursing are all important. Give Bradbury's Brazilian Specific. Let the diet be wholesome and nourishing; feed but little at a time, but at short intervals, and allow 2 tablespoonfuls of Davis Stock Food to each feed until the improvement becomes marked, then reduce to 1 tablespoonful. Take the chill off the water before you lead the animal to the drinking trough; or it may be better for you to water by pail. If there are signs of indigestion, Davis Stock Food will take care of it. Purge gently with linseed oil, dividing the dose two or three times. You may give the horse a moderate quantity of starch in the drinking water, and if diarrhea and colic are among the symptoms you should confine yourself to dry feeds, and administer astringents, such as opium and tannic acid. In all serious cases you would better call in a veterinarian, and let him do the prescribing at the start. Milder cases you can handle yourself by following the above directions.

Chronic Gastritis. This is the same form of the disease that in man is called dyspepsia, or chronic indigestion; also chronic catarrh of the stomach. The disease is given the same several names in the horse, and is in substance a chronic inflammation of the stomach, producing a gradual thickening of the membrane, and more or less pronounced organic changes in the gastric glands. The formation of mucus is more rapid, the appetite becomes irregular, and the condition of the animal gradually becomes worse.

Causes.—In the majority of cases it is brought about by a faulty diet, irregularity in the feeding, too fast eating, bad teeth, making it impossible for the patient to masticate the feed properly; also large drafts of ice cold water, especially when the horse is heated. The disease may be associated with others of the more common affections of the stomach; in fact, all chronic ailments of the internal organs, including the heart, lungs and liver, may either exist side by side with it or precede it.

Symptoms.—As the disease progresses the appetite of the patient is very irregular, and while at times it may be satisfactory it at other times is altogether lost. As in all diseases of the stomach the tongue is coated, the breath is sour and foul, the act of digestion slow and laborious, often appearing to stop for a while, causing constipation and the chronic state of indigestion which mark the affection. The feed may be forced to remain in the stomach long enough to ferment and decompose. In the progress of the malady diarrhea and constipation may interchange regularly, or sometimes there is a chronic state of diarrhea and sometimes of constipation. The patient gradually becomes poor and emaciated, assuming a bedraggled, worn appearance. It is not a disease attended by fever or any great change in the pulse.

Treatment.—The first thing for you to do is to correct and regulate the diet. You should give preferably soft, succulent, easily digested feeds, and always include Davis Stock Food, 2 tablespoonfuls to each feed, with the ration. Administer the feed in small quantities and find some way by which you can make the patient eat slowly, giving it time to chew the feed to better advantage. This is very important, as it most often is the swallowing of coarse, half masticated feeds, which the digestive organs and stomach juices are unable to cope with, that causes the disease. If constipation is present, or whenever the indigestion becomes pronounced and severe, you should purge to relieve the stomach of its burden. The medicines recommended are belladonna or opium, to relieve pain; bismuth, sodium bicarbonate, charcoal, etc., to counteract fermentation in the stomach. Do not forget that Davis Stock Food is the

great corrector of the digestive and assimilative functions, and that if you use it regularly, in health as well as in disease (1 tablespoonful to each feed in health; 2 tablespoonfuls to each feed in disease), such a disease as chronic dyspepsia appearing among your horses will be a very rare occurrence.

Stomach Stagers. Technically this disease is called vertigo-abdominalis, and another popular name given it is impaction of the stomach. Its nature is indicated by this last name, for it is indeed nothing more nor less than a distention of the stomach with feed.

Causes.—When we compare it with the size of the body the stomach of the horse is small, and for this reason it is natural that it should receive only small quantities of feed at a time, as compared with many of our other domestic animals. But, as he has a large body to sustain, it also follows that we must feed him often, in order that, in spite of the small quantity of feed allowed with each meal, he nevertheless may receive sufficient nourishment to keep in vigor and strength. It is a very good idea to use a nose bag in giving the horse his noonday meal. In this disease, as in the other forms of stomach disorders, it holds good that too hasty eating, the animal gulping down quantities of half masticated, coarse feed, such as cornstalks, wheat, oats or cut feed, is the principal cause of his digestive system and stomach breaking down. A weakened condition of the system, the flow of blood to the organs being impaired and insufficient, may also bring it about.

Symptoms.—The animal is nervous and uneasy, and shows signs of colicky pains. It may continue to paw the floor in its stall, and if space permits it will lie down, roll itself over and over, perspire, vomit, and show other signs of distress. After a while there may be delirium and thereupon a state of coma, it being this delirious condition which gives the name of stomach stagers to the affection. It is a serious disease, and the animal should receive the best of care and nursing while it lasts.

Treatment.—The stomach should be relieved of its burden, which is attended with some difficulty, as the crowded condition of the feed in the organ makes it almost impossible for medicine to gain access and become active. You may, therefore, have to resort to both purges and injections, and at the same time feed the patient on soft, easily digested feeds, preferably of a succulent nature, vegetables, mash, etc. Aloes, linseed oil, and enemas of a stimulating nature should be resorted to, and in order to stimulate the digestive glands into renewed activity you should include Davis Stock Food, 2 tablespoonfuls to each feed. This is of the utmost importance if quick relief and a cure are to be had. In order to relieve the heat and vertigo you should sponge the head with cold water, or apply a small bag of ice to the top of the head.

Rupture of the Stomach.

This name indicates a state in which we find the stomach lacerated and torn in such a way that its contents to a larger or lesser degree ooze into the surrounding space, called the abdominal cavity. It may be caused by the animal falling heavily upon a hard ground while the stomach is overloaded with feed, or the straining of the organ from colic and wind may bring it about. Again, if you fill up the stomach of the horse, and immediately afterward put him to heavy work; or wounds piercing the walls of the organ produced by a shaft, pole, etc. Another cause is when the tissues become softened and weakened by disease of the general system.

Symptoms.—In the beginning the symptoms very much resemble those produced by colic; then there is a lull or intervening space during which the patient seems to improve, but only for a brief spell. It is followed by a suddenly weakened pulse, labored and difficult breathing, shivers and trembling, an unsteady, staggering walk, and more or less pronounced signs of collapse. Another symptom is the cessation of the usual rumbling sound or murmur in the bowels. You should be careful not to draw too hasty conclusions, however, as these signs may be caused by some other disorder of the bowels, no rupture having occurred. Sometimes the patient will suddenly sit down on its haunches, or will throw itself down on the ground with the back parts elevated. If the rupture in the walls is near the heart there may be more or less profuse vomiting. It is a serious disorder, and is often followed by death.

Treatment.—You should call in a veterinarian. Meanwhile keep the patient quiet and comfortable. After the patient has been attended to, and the pain has subsided, feed the animal on soft, easily digested feed, in small quantities at a time, adding Davis Stock Food to each feed.

DISEASES OF THE BOWELS.

Spasmodic Colic. This is an affection of the bowels, caused by spasmodic contraction of the muscular structure of the intestines, with collection of gases in different parts of the bowels, accompanied nervousness, restiveness and evident symptoms of pain and distress. The feces and urine are suspended for the time being.

Causes.—Horses of all animals seem to be the greatest sufferers from colic and allied diseases. Among the various reasons which the specialists on the horse give for this are the animal's inability to vomit, the unusual length of the intestines, the fermentable feed they partake of, the liability of the intestines to become knotted or twisted on account of their length, etc. The disease may be brought about by chills, cold drinks, especially when the animal is heated, it gulping down too large a quantity of water in too brief a space of time; also overloading the stomach, frozen or poor feed or too rich feed. It is also known to occur in horses on long marches; as a result of starvation and exposure.

Symptoms.—The symptoms of the disease appear all of a sudden. You may hitch the animal to a wagon and drive him a mile or two, when he will abruptly stop, look around at his side, rear, paw, crouch, and kick himself in the belly with his hind hoofs if he can do so. If at liberty to do so he may of a sudden throw himself down and roll over on his back, keep lying thus, with all four legs in the air, then jumping up, pawing and kicking, and showing other signs of pain and distress. The attacks come and go, as is evidenced by the periods of apparent ease and rest, during which the peculiar antics of the patient stop. Sometimes there may be ten to twenty minutes between the spasms. The pulse, at about 40, gradually increases in the course of the attack. There is profuse perspiration, but the temperature runs up but half a degree or so, or remains normal throughout the progress of the affection. The attacks may be accompanied by either diarrhea or costiveness. The ears and extremities generally are clammy and cold, the muscles tremble, the nostrils may dilate, the expression is anxious and wild, and at times the sweat may turn from hot to cold.

Treatment.—Davis Colic Cure is a positive cure for this malady, and should be given as soon as the first symptoms show themselves. Flaxseed oil, aloés, enemias of soap suds, salt or glycerine, may be resorted to, to relieve the confined and congested condition of the bowels. When you start feeding again, let the feeds be small and easily digested, always adding Davis Stock Food, 2 tablespoonfuls, immediately after the attack, and 1 tablespoonful regularly thereafter, to each feed.

Tympanites. This is the form of colic in which wind or gas becomes confined in the stomach and intestines. Technically this disorder is called tympanitic colic, and it is also known as gaseous colic, flatulent colic, and wind colic.

Causes.—It most often occurs in the spring, succulent young grasses, June clover, etc., and also the change from the stable to the pasture feeding, bringing it about. Gases form as a result of the feed fermenting in the bowels, and the condition is indicated by the apparent swelling of the belly, with gas now and then rising to and finding an outlet through the mouth, and wind breaking from the anus. It is also likely to occur in hot weather, especially after drinking copiously of very cold or marshy water. In all cases of colic, no matter what the form and cause, Davis Stock Food, used in accordance with directions, will act both as a preventive and curative agent, supplying as it does the digestive juices lacking, and distributing them in correct proportion. It may be mentioned here that the so called windsuckers are especially prone to attacks of this form of colic.

Symptoms.—Most prominent is the swelling of the belly, caused by the gases which have accumulated in the organs. The attendant pains may or may not be severe. At times a considerable period may elapse while the gases are accumulated in the passages, the abdomen only gradually distending, but attaining a considerable size before the patient shows signs of distress. If this is the case the gas principally collects in the large intestines, the swelling showing itself most prominently on the right side. If it is the small intestines which are affected, there will generally be a peculiar arching of the neck, with attempts

at vomiting, and gas escaping from the mouth. The patient is restless, stamps, paws, throws itself down and rolls upon the ground, breaks wind, etc. It is not an exceptionally dangerous disease, except in rare cases when it appears in its most severe form. The rule is that the patient recovers promptly.

Treatment.—Give Davis Colic Cure at once and repeat in one hour if not relieved. If you think it necessary resort to purgatives and enemas, made up of glycerine and soap suds, or you may prepare a stimulating enema of turpentine and soap suds. You may also with good effect resort to massage of the abdomen, manipulating it vigorously with a straw wisp or with your hands and arms, and, if need be, puncture the caecum. If you have not done this before it is best for you to call in a veterinarian and have him show you how, before you attempt it.

Invagination.

This is a form of colic which is caused by an altered relation of the intestines to each other; as, for instance, when the intestines for some reason double and fold over each other in an unnatural way, causing knots and layers; or when they twist into each other in such a way as to interfere with their proper functioning or even stop the passages entirely.

Causes.—It may be produced by cramps or spasms of the muscular tissue, or by stricture of some portion of the intestines, interfering with the circulation and proper functioning of the organs.

Symptoms.—There are the usual symptoms of colic. The patient is very much distressed, stamping, pawing, and otherwise exhibiting anxiety and pain. At the start there is no fever, but during the progress of the disease the temperature may run up to 104 or 105 degrees Fahrenheit, indicating the approach of death. The pulse is weak and irregular, and cold and hot sweats succeed each other.

Treatment is of but little avail, and the best you can do is to prevent the disease from occurring by using Davis Stock Food regularly, keeping the horses in strong and vigorous condition. If the disease exists you may relieve it by administering oils, flaxseed tea, enemas, purges, etc. Linseed oil also is good.

Enteritis.

This is another form of bowel disorder, and inflammation of the organs, attended by fever and pain of a more or less severe nature.

Causes.—Poisons that have entered the stomach, especially alkalies or acids, which irritate and corrode the glands. It also may be secondary to liver diseases, castration, embolism, or hernia and colic.

Symptoms.—The breathing is labored and deep, and the temperature in the progress of the disease may run up to 104 or 105 degrees Fahrenheit, dropping to 103 or 103½ degrees Fahrenheit after the intestines have been relieved of the irritating matter. If it is a fatal attack it will run up again as the end draws near. The pulse is rapid and weak, the breath is foul, the mouth parched or clammy and hot, a frothy discharge of saliva may drip or run from it at times; there are symptoms of colicky pains, the patient runs or walks around and around in circles, stops for a moment, stamps, paws and kicks the ground, and walks around again. Sometimes he may become exhausted and lie down and rest for a little while, then up and around once more. He exhibits great care in lying down, usually going down on his fore legs first, remaining in this position for a short while, then carefully lowering the remainder of his body, attempting to get over on his back, and if he succeeds remains thus for a long period, then of a sudden rolls over, gets up and goes on with his circuitous walk. He may continue thus for a day or two days. If stalled and unable to walk he may rub off the skin from all the protruding parts of the body against the wall of the stable in his agony to keep in motion. It is a very serious disorder, although recovery is possible with prompt and careful treatment.

Treatment.—You should endeavor to keep the patient quiet and comfortable, or let him have his liberty in the pasture to walk about as he likes. If there is diarrhea, give tincture of opium, starting out with half-ounce doses and gradually increasing the amount if necessary. In administering opium, always bear in mind that it must be used in repeated and, if necessary, increased doses until the desired action is brought about. Give Bradbury's Brazilian Specific to care for the fever. As local treatment you may apply hot blankets around the abdomen, holding them in place with a dry blanket and girths. Let the diet be limited to flaxseed tea for about forty-eight hours, or until the crisis is over, and if you cannot make the patient drink it you may give him a limited quantity as a drench. Before you commence feeding again, administer oil, and let the feeding of solids thereafter at the start be very light, allowing 2 tablespoonfuls of Davis Stock Food to each feed. The disease as a rule may be prevented if you use Davis Stock Food regularly, in health as well as in disease.

Diarrhea. **Causes.**—The diet is almost entirely responsible; changes in the feeding, incorrect feeding, too soft or succulent feeds, frozen or decaying feeds, also swallowing copious drafts of cold water, especially when heated and strained, bringing it about. Or it may be a complication of the lungs, heart, blood or intestines. At times it is caused by parasites in the stomach and bowels, and it is a natural consequence of purging and enemas. It said that horses whose hips are narrow and high are predisposed to this stomach disorder.

Treatment.—In treating for this condition you should bear in mind that diarrhea may be and often is an effort of nature to rid the system of a poisonous irritant, and you should therefore not be too much in a hurry to stop it. Indeed, it is often the case that sudden stoppage of diarrhea has been of fatal consequence, producing constipation, enteritis and death. In treating the patient you may resort to starch in the drinking water, say half a pound to a pail of water; or chalk, if you have not sufficient starch on hand, say a ball of chalk in half a pail of water. Flaxseed tea also is good, and in severe cases you may resort to opium. Davis Scour Cure may be used with good results. Let the patient have rest and quiet, and in driving administer the drinking water half an hour to an hour before you take the animal out. Davis Stock Food given in a wholesome ration will do much to correct and overcome this disorder.

Constipation is a temporary suspension of the peristaltic action and proper functions of the intestines, due to enervation, lack of the proper amount of the juices and fluids that oil the canals, causing a stopping and retention of the fecal matter. By costiveness we mean where there is a lack of secretion, causing the feces to become small, hard and ball shaped. By constipation we mean the state where the passage is stopped entirely. In common, every day language, however, the two terms are often confused.

Causes.—The diet here again is to blame; overfeeding, abrupt changes in the feeding, old age, and enervation and exhaustion of the entire system causing the supply of blood to the intestines to become insufficient to keep them in healthy activity. It may also be a secondary affection, caused by diseases of the liver, tumors, heart, nerves, other stomach disorders, or an impaired and sluggish circulation. The main symptom is the stoppage of the feces, with loss of appetite and sometimes pain similar to that with colic.

Treatment.—Correct the diet of the patient, and give Davis Stock Food, 2 tablespoonfuls in each feed, to bring the dormant glands into activity, causing the necessary secretion of juices, and stimulating peristalsis. Let the patient have laxative, soft and easily digested feeds until the condition is corrected, then continue to allow such feeds between whiles, always adding Davis Stock Food to insure against a recurrence. Oil cake, calomel, aloes, etc., are good. If necessary you may give occasional enemas to aid the purges in softening the bowels and increasing the peristaltic action which moves the feces on to the anus. If there are colicky pains, give opium or anodynes, such as you may have on hand, or Davis Colic Cure will prove very prompt acting and efficacious.

Peritonitis. This affection appears in various aspects and under various conditions, and is divided into primary or secondary, general or local, acute or chronic peritonitis. Plainly speaking, it is an inflammation of the peritoneum.

Causes.—In the majority of cases it is a secondary disease, but it also may appear as a consequence of some unsuccessful operation, as badly performed castration, or it may be associated with numerous other diseases of the liver or stomach. Pregnant mares may become affected, or it may appear after birth attendant upon inflammation of the womb. It is more often met with in man than in animals.

Symptoms.—It is indicated by fever and restlessness. The temperature varies and may run up to 104 or 105 degrees Fahrenheit in the beginning; moderating as the disease progresses. Breathing is labored and difficult, the visible membranes reddened, and appetite impaired or entirely lost for the time being. The bowels as a rule are constipated, and tympanitic colic may be present. There is considerable pain, and the patient is restive, uneasy and nervous, carefully going down on its fore legs before lying down, as if the act caused it pain. The disease is serious and demands prompt and careful treatment.

Treatment.—Keep the patient quiet and comfortable, and give Bradbury's Brazilian Specific. Apply heat and moisture locally, and give 2 tablespoonfuls of Davis Stock Food to each feed. Let the feeding be light and nourishing. It should be mentioned here that in rare instances this disorder may cause an accumulation of serous fluid in the peritoneal or abdominal cavity, in which case blisters may be applied, and possibly tapping will be necessary.

DISEASES OF THE LIVER.

The liver is, as is well known, one of the most important organs of the system. Numerous duties depend upon it, and it is small wonder that it occasionally should go on strike or its action become impaired. Everything should be done to keep it in good health, retaining its full working capacity unimpaired, for, if this is not done, the whole system must necessarily suffer seriously.

Icterus. This is a form of liver disease indicated by the yellow appearance of the visible membranes, and is caused by the forced reabsorption of the bile pigment by the blood. Plainly speaking, this affection is called jaundice, or the yellows, and it is well known that it may interfere seriously with the general health and usefulness of its victim. There are two forms, obstructive and nonobstructive to the ducts.

Causes.—The first mentioned form, called the hepatogenous form, generally is caused by foreign bodies, parasites, calculi, etc., entering and becoming located in the ducts. Or there may be inflammation of the membrane of the duct, tumors or stricture. The hematogenous form destroys the red blood cells, and causes necrosis, or death of the cells of the liver. It is usually brought about by drugs or other poisons finding their way into the organ.

Symptoms.—The feces may become colored with the bile pigment, and the eyes in aggravated cases turn distinctly yellow. In other cases the liberated bile may find an outlet in the urine, and, when this contains a considerable quantity of it, it does not flow into the bowels in any great amount, the feces attaining a grayish color and pasty consistency as a consequence. As a rule the disorder is complicated with constipation. Often the beat of the pulse becomes noticeably slower, and in the more complicated and severe forms there may be cerebral or nervous affections of a more or less pronounced nature, delirium and coma appearing in rare instances.

Treatment.—You should make it your object to find out what causes the affection, and, as soon as you have ascertained this, bend your energies toward removing it as promptly as possible. Purge if necessary, keep the kidneys active by the aid of diuretics, and use Davis Stock Food regularly with the feed, it having special action on the liver—2 tablespoonfuls to each feed while the animal is recuperating and 1 tablespoonful to each feed after he has regained his health. These simple means will, as a rule, overcome all but the most severe forms of jaundice.

Congestion of the Liver. This name indicates a state where too great a quantity of blood flows to the liver and the surrounding tissues, causing the arteries and veins of the organ to be clogged up or rendered sluggish and inactive from the congestion. Any heavy feed may bring it about temporarily, for a short while after it enters the bowels, but it only becomes a disease when you persistently and for a prolonged period overfeed the horse. Then it will gradually attain a chronic tendency and, as a functional disturbance, cause serious injury to the general health and well being of the animal. You should therefore be careful not to overfeed at any time, and as a precaution keep the digestion and circulation up to the standard at all times by regularly adding Davis Stock Food to the ration. There is another form of the disease which is called passive hepatic congestion of the liver, or simply passive congestion of the liver, and this is where for some reason or other the blood becomes clogged up in the veins of the organ.

Symptoms.—The urine contains considerable quantities of bile pigment, while the feces are gray, clay colored and of an unnatural consistency for want of it. There may also be symptoms of a catarrhal condition of the stomach, and the mucous membranes may turn yellow as a consequence of the disordered liver.

Treatment.—Hygiene, sanitation, saline purgatives, and, first and last, careful and correct feeding, changing the diet to meet the requirements of the patient, and, most important of all, 2 tablespoonfuls of Davis Stock Food to each feed, as long as the animal shows signs of the disease, then reducing it to 1 tablespoonful and keeping this up all the time. This, with moderate exercise, fresh air and liberty to roam the pastures, will soon restore the horse to perfect health, if nothing else be the matter with him.

Hepatitis.

There are two forms of this affection, acute and interstitial hepatitis. The first consists in an acute inflammation of the tissue of the liver, the so called hepatic cells, which may result in suppuration of a more or less severe nature. It is a rare disease in the horse, but age and excessive heat may sometimes bring it about. Chills and fever precede it, and the patient shows signs of pain if you press around the region of the liver. Colic, constipation, lameness of certain parts, and possibly jaundice, may be associated with it, and if suppuration sets in pus forms about the tissue. Davis Stock Food, without any other medication than a purge or two, will correct the trouble.

Interstitial Hepatitis,

technically called cirrhosis of the liver or sclerosis, is a chronically inflamed state of the interstitial tissue of the liver. (We distinguish between the tissue proper, or hepatic cells, and the interstitial tissue, being the interspaces or inter-sections between the tissue proper.) There is a gradual destruction of the liver cells, due to this connective (interstitial) tissue material growing over them, pressing them always closer together to make more room for themselves, forcing them to contract until they become hardened, small and lifeless.

Causes.—It is usually associated with chronic diseases of the heart or some affection of the lungs. In old age we also sometimes find that overfeeding or otherwise incorrect feeding may bring it about. Or, in some instances, tumors in the liver may produce it. This is said to be especially marked as a cause in the gray horse, although no reason for this phenomenon is given.

Treatment.—You should carefully regulate the diet, and allow Davis Stock Food, 2 tablespoonfuls to each feed. Feeds which are digested and assimilated easily should be preferred, this being especially the case when you do not have the stock food at hand. This acts as a digester and assimilator, and therefore to a certain extent does away with the necessity of selecting a too dyspeptic and delicate diet. You should here, as in the foregoing diseases, see to it that the congestion is relieved by the aid of properly administered saline purgatives. Give the animal proper care, in the way of hygiene, fresh air, exercise, etc., and you will find that the disease will soon disappear if you follow above simple directions.

Amyloid Liver.

The liver enlarges and becomes firm and resistant to the touch. The disorder is also called waxy liver or lardaceous liver. All you can do for this condition is to be careful about the diet and hygiene of the patient, giving Davis Stock Food as usual with each feed, allowing the animal exercise, fresh air—in short, a little special attention and nursing along these lines will bring him about all right.

Fatty Liver.

There is fatty infiltration and fatty degeneration of the liver, and we find that in the second form (fatty degeneration) the substance of the liver cells has given way to fat, while in fatty infiltration there is simply an oversupply of fat in the cells. This last condition is not unnatural, as the cells in the healthy animal always contain minute globules of oil or fat; fatty degeneration of the liver, however, means complete destruction to the cells of the organ.

Causes.—In an overfat animal the liver at times seems to accept the function of provision or store house for the oversupply of fat that has collected in the system. It may also be caused by phosphorus and certain other poisons, or where for some reason or other the general system has become anemic and weak. In appearance the liver, which has become subject to fatty degeneration, is large, smooth, bloodless, and of a pale whitish yellow color.

Symptoms.—There are no very distinctive symptoms to mark the presence of this disorder. But it may be associated with jaundice; and horses that are subject to colic often suffer from this condition of the liver. The feces of the patient may attain a very light color.

Treatment.—Limit the diet, use purgatives (saline) occasionally, exercise the horse regularly, let him have plenty of fresh air, and liberty to roam the pastures at will throughout the summer months when no work is at hand. Allow 1 tablespoonful of Davis Stock Food to each feed when the horse is stabled.

Splenitis.

Spleen diseases are rare in the horse, and deserve but passing notice in this treatise. Splenitis is an inflammation of the organ, sometimes occurring as a complication with liver diseases, enlarging the organ to some extent. It comes in as part of the disease with which it is complicated, and the same treatment will take care of both affections. Pancreatitis is an allied disease, affecting the pancreas or organ which is known as the abdominal salivary gland, or more popularly sweetbread. It is accompanied with fever, emaciation and expulsion of fatty fecal matters. It may exist both in an acute and chronic form, and the treatment must vary with the symptoms with which it is associated. It is not very common or dangerous in the horse, and is only mentioned incidentally.

DISEASES OF THE URINARY SYSTEM—KIDNEYS.

Congestion of the Kidneys.

In technical language this affection is called renal hyperemia, and for convenience we divide it into two forms, which are called active or arterial congestion and chronic congestion (the latter taking the descriptive adjectives passive, venous, mechanical, or chronic congestion). It may simply be defined as a state under which for some reason or other an oversupply of blood is present in the kidney vessels.

Causes.—In the active state we find that the cause may be traced to such conditions as prolonged exposure to drizzling rains, storms, slush or otherwise wet, inclement and changing weather. We also trace it to drugs and other poisons in the system, among which may be mentioned carbolic acid, turpentine, potassium nitrate, chaptalides, and similar irritants. Or there may be paralysis of the vasomotor nerves of the kidneys, making it impossible for them to circulate and throw out the blood in the regular systematic manner which is present in health. Heart diseases in the majority of instances are responsible for passive congestion of the kidneys, or it may arise as a consequence of certain diseases of the lungs, tumors pressing upon the renal veins, thrombi, or the congested and impaired condition of the system attending pregnancy.

Symptoms.—Frequent and copious voiding of highly colored urine, which may or may not contain traces of blood, but as a rule a large amount of albumen; this, accompanied with a certain state of dullness and listlessness evidenced by the patient, indicates the active form of congestion of the kidneys, the symptoms of the passive form being so little different as not to deserve any special mention.

Treatment.—You should apply hot fomentations over the region of the kidneys, and stimulate the skin and kidneys into greater activity, which you may do with preparations of flaxseed (flaxseed tea) or mucilage. Camphor, morphine or potassium iodide in moderate doses may be resorted to as internal treatment in the more severe cases. In order to increase the heart's action and reduce the quantity of blood in the organs, it is alone necessary to restore a healthy digestion with attending normal, healthy circulation of the blood throughout the entire system, and this you may do by adding Davis Stock Food in the proportion of 2 tablespoonfuls to each feed with the daily ration, reducing it to 1 tablespoonful after the horse has recovered.

Nephritis.

There are the parenchymatous and interstitial forms of nephritis, and either of these may become either acute or chronic in its progressive run. We seldom meet with the disease in the horse, and when it does occur it is generally either overlooked or taken for some of the more common affections. The acute form of the disorder may be described as a certain inflammation of the kidneys, including the intertubular tissues. It may be of either a primary or secondary nature, arising from exposure to inclement weather or such drugs as arsenic, turpentine, carbolic acid, phosphorus or chlorate of potash. Or we may find it at times as a complication

attending upon pregnancy, resulting from the crowding and pressing upon the tissues in the neighborhood of the organs. Some forms of poisonous, malignant fevers also may produce it, and a number of the common forms of lung and stomach diseases may bring it about.

Symptoms.—Chills, fever and general weakness may precede it if it is due to exposure to wet, cold, or otherwise inclement and unseasonable weather. The urine becomes darker, of a high, abnormal color, containing small quantities of blood, fiber and albumen at times. If you let it stand over night you will find a conspicuously heavy deposit in the vessel in the morning. And there may be more or less anemia, poverty of the blood, impairment of the general circulation, or dropsy present, the pulse becoming harder, the skin dry and hot, the walk stiff and unnatural, the back more or less rigid, with pain upon pressure over the region of the organs. Some cases recover, while others die, depending upon the condition of the patient, and the general care and attention given it after the disease is discovered.

Treatment.—See that the patient is given perfect rest and quiet, and promptly apply bandages or blankets to bring about as copious perspiration as possible. In order that the affected organs (kidneys) may be properly washed out you should allow the animal all the water he will drink, and then use purges to clean out the bowels, thus giving the affected kidneys as much rest from their ordinary labor as possible. If the disease is of a secondary nature you should treat its source, or the disease from which it springs, at the same time, and as a rule they will recover together. Give Davis Stock Food to stimulate the exhausted system. In all serious cases you should call in a veterinarian.

Chronic Nephritis.

This form of the disorder is again divided into two forms; namely, chronic parenchymatous nephritis, and chronic interstitial nephritis. The latter is by far the more common and serious.

Chronic Interstitial Nephritis,

more simply known as contraction of the kidney, granular kidney, also sometimes cirrhosis of the kidney, consists in a more or less pronounced chronic inflammation of the interstitial or connective tissue (as distinguished from the tissue proper) of the kidney, this causing pressure and contraction of the secreting structures of the organs, thus seriously and in some cases irremediably interfering with their normal functioning.

Causes.—The disease is commonly the result of abuse in the form of overwork, exposure to the rains and storms of the fall and spring seasons or to the heat of the summer; neglect of any kind, added to a high strung and nervous temperament, may bring it about. But it is a comparatively rare affection in the horse.

Symptoms.—The most prominent symptom is a visible increase in the amount of urine voided, it at the same time attaining a clear yellow color, without sediment of any kind. The pulse may become harder, there may be a more or less pronounced thirst, with irregularity in the digestion and appetite. If dropsy is not a complication the skin as a rule is hot, and dry as parchment.

Treatment.—You should keep the bowels active and the skin in the best possible condition. This is best done by seeing to the digestion and assimilation, for if these act properly the pores of the skin will be open and active. It is needless to say that the best remedy for the digestion and assimilation is Davis Stock Food regularly added to the feed ration, and if you give this, possibly with small doses of iron or mercury added at intervals, you have done what you can for the horse, and it may remain strong and useful for a long time in spite of the fact that the disease in itself is incurable. It may be well for you at the outset to call in a veterinarian and let him give you some good advice to include with our directions.

Pyelitis,

another form of kidney disease, characterized by inflammation of the mucous membrane of the so called calices or pelvis of the organs. If it is attended with pus formation in the pelvis, it is called pyonephrosis. As a rule it is a secondary affection, due to certain kinds of irritating poisons, as, for instance, calculi. Or there may be an inflammation of some of the surrounding tissues producing it.

Treatment.—You should keep the patient quiet, give him plenty of rest, all the water he desires to drink, restrict the diet, and add Davis Stock Food, 2 tablespoonfuls to each feed. Davis Veterinary Liniment, hot fomentations, etc., applied over the region of the kidneys, will be beneficial. Bradbury's Brazilian Specific also may be used with good results. Dropsy of the kidney, floating kidney,

etc., also should be treated constitutionally by restoring perfect digestion and assimilation with Davis Stock Food.

The Urine.

The urine consists of organic and inorganic constituents. Urea, uric acid, hippuric acid, etc., are the chief organic, and sodium, potassium, calcium and magnesium (carbonates, chlorides, sulphates, etc.) the principal inorganic constituents. It is produced by the constant tissue change going on in the body, and with their normal or abnormal interchange the urine, too, is altered in constituency, color, quantity, odor and general health. The increase or decrease in quantity is ascribable to several causes; as, for instance, if the animal perspires freely less urine is passed, and when the skin is chilled and the pores clogged up the quantity is increased. The color may vary without the health being in any way impaired, simply as the result of a changed diet, and at different times we find it shading from yellow into red, from red into brown, and again it may become clear and transparent as water. The latter, however, generally indicates a diseased condition of the liver, and in the same way, when the urine becomes dark brown, black (as in azoturia), bloody, smoky red, milky, greenish or reddish brown, some functional disorder of the system is generally responsible for the peculiar color attained. The urine of the horse, as a rule, has a strong, peculiar odor, as of ammonia, varying somewhat with the nature of the feed ration. Its normal constituency is distinctly alkaline, the exception being in the case of the suckling foal, or in animals suffering from starvation, or malnutrition, where we find it a pronounced acid. Varying changes take place when the horse becomes diseased, dependent upon the nature of the affection. There is a simple way by which you may determine as to whether the urine of your horse contains an excess of what is known as fixed alkali, that is, phosphates or carbonates, or volatile alkali, that is, ammonia. Simply procure a quantity of red litmus paper from your druggist, moisten a piece of this partly in the newly voided urine of the animal, and hang it out in the air to dry. If after it has dried the blue color remains, you will know that the urine is of the fixed alkali nature, while if the red color should return, it means that the volatile alkali constituency predominates.

If you desire to examine the urine further you may collect all the urine passed in the course of twenty-four hours, taking a sample of the combined mixture. You may bring out the earthy or alkaline substances (phosphates) by heating this sample of urine in the test tube of a veterinarian. A cloudy or milky appearance will result, indicating the presence of the alkaline phosphates looked for; and in the progress of the experiment you should mark that if you add acetic or nitric acid to the mixture the milky appearance will disappear. If you suspect an oversupply of albumen in the urine you may make sure of this being so by boiling a similar mixture of urine in the test tube, when the same milky appearance as presented in the former case will indicate the presence of albumen, provided it does not disappear on the adding of nitric acid. If you wish to test for bile in the urine you should heat some nitric acid until yellow, adding while you are about it some little pieces of wood. After you have permitted the liquid to cool off, float the urine you desire to test on the acid, and if bile pigments are present a green band will form at the junction, shading into red, blue, yellow and violet. If the urea in the urine is excessive, the rhombic shaped crystals of the nitrate of urea separate if you add nitric acid to a cold mixture of urine containing parts of twenty-four hours' voidings. You may ascertain this by using for your experiment a plate or watch glass. Spread a thin layer of the urine you desire to test on this, and if it attains a dark red or smoky color you may safely assume that blood is contained therein. Sugar in the urine is indicated by its pale color, and the froth that follows upon its being voided or shaken. To ascertain if the urine contains pus the aid of a microscope is necessary.

Hematuria, or Bloody Urine.

This name indicates that blood is present in the urine, attending upon some functional disorder of the general system. Diseases as hemophilia, hemorrhagica, purpura, also certain fevers, drugs, germs, stone or gravel in the kidneys or wounds of a traumatic nature, may bring it about. The urine attains a smoky or bright red color, and contains a quantity of red blood cells, which may or may not be visible to the naked eye, depending upon the number. If the quantity of blood is large and the hemorrhage producing it severe, or its source one of the vital organs, disease is serious and may prove fatal. Usually the seat of the hemorrhage is in the kidneys, bladder or urethra, and it is comparatively rare that it in itself becomes of very serious consequence.

Treatment.—Take good care of the patient, brace him up with nourishing feed, adding Davis Stock Food, 2 tablespoonfuls to each feed, and, if the loss of blood going on in the urine is persistent and severe, give him an occasional stimulant, a little alcohol or whisky in his drinking water. Davis Veterinary Liniment solutions in which bandages are soaked and then applied over the kidneys will prove very beneficial. You should try to find out where the hemorrhage producing the blood is located and make your treatment in accordance with this.

Pyuria, or pus in the urine. It is generally complicated with certain other diseases of the genito-urinary organs, among which may be mentioned leucorrhœa, urethritis, cystitis, etc. Or in some cases it is produced by ruptures formed by abscesses and opening into the urinary passages. It is not a very common disease, except when complicated with functional derangements of the general system.

Treatment.—There is no special treatment for this disorder. It must be treated together with its source. However, you may use Davis Veterinary Liniment solutions over the kidneys, while at the same time ascertaining and treating for the disease upon which the disorder is dependent. Feed the patient well, adding Davis Stock Food to the nourishing ration. When the digestion and general healthy circulation are restored to the body, both this and its dependent disease, if they be not chronic or severe in their nature, will speedily give way to health.

Anuria. This is the name given to the condition in which for any reason there is a complete suppression of the passage of urine in the animal.

Causes.—Stone, gravel, or other obstructions in the kidneys, urethra and bladder may produce it. Or it may be dependent upon certain contractive poisons, badly performed operations, causing injuries to the organs; or, in rare instances, intense nervous irritation, due to some derangement of the nervous system, is responsible.

Treatment.—You should clean out the bowels by purging, and use diuretics (diuretics are medicines that increase the flow of the urine; you can get them at your drug store), etc. As local treatment, resort to hot applications over the organs, Davis Veterinary Liniment, or any other good counter irritant, if you have not got it at hand.

Incontinence of Urine, in which the condition mentioned above is reversed, consists in an inability of the animal to hold the urine, which is dripping from it more or less constantly. It may be due to some derangement of the nervous system, or the spinal cord may have sustained an injury reacting upon the parts and paralyzing them, making it impossible for the patient to hold the urine in the organs designed by nature for that purpose. The treatment recommended for this annoying condition is to strengthen and tone the entire system, this being especially so if some nervous trouble is the cause. Allow the patient an ample ration of nourishing, wholesome feed, making it palatable and appetizing with Davis Stock Food, 2 tablespoonfuls to each feed; and, with the enhanced digestive and assimilative activity, the whole system will be gradually toned up, and with it the special nerves and muscles of the urinary organs. Also allow the patient plenty of fresh air, liberating him into the pasture and letting him roam at will.

Cystitis is a bladder disease, an inflammation of this organ, which may be caused by certain medicines or chemicals. Sometimes it is a primary disorder, and at other times we find it to be complicated with some other affection of the surrounding organs. It is indicated by the urine attaining a peculiar opaque color, pus cells, blood and at times shreds of mucous membrane being contained therein. In treating for this disorder you should merely allow the animal plenty of rest; and prepare and give it mucilaginous beverages, such as, for instance, a good flaxseed tea, which will be cooling and soothing to the affected organs. The bladder should be washed out with solutions of quinine, bichloride of mercury, etc., but have a veterinarian do this. Let the diet be wholesome and nourishing, adding Davis Stock Food to the ration as usual. In severe cases belladonna or morphine given by the mouth or in the form of suppositories. Plenty of fresh air and, if possible, liberty to roam the pastures for a little while should be allowed.

DISEASES OF THE CIRCULATORY SYSTEM.

It is undoubtedly a fact that diseases of the general circulation often are present without the layman being aware that they exist. He may know that something is the matter with his horse, but is unable to define the disorder, and as it does not seem to aggravate enough to warrant his calling in a veterinarian he simply puts it down as a being out of condition of the animal, and lets it go at that. The reason why such affections are hard to define and diagnose is that the heart, mainspring of the circulation, which sends the blood pulsating through the veins to all parts of the body, is one of the most deeply situated organs of the system, making it a matter of difficulty for the physician to examine it and quite impossible for the layman (except in a general way). You probably know that the normal number of heart beats should be from 36 to 40 per minute, increasing or diminishing according to the temperament and environment of the animal. Thus, in the hustle and bustle of city life, where the animal is prodded and driven to a high state of activity, nervous and physical alertness, as it were, we find the number of pulsations materially increased, while in the quiet and calm of country life the number of beats is less, but the pulsations more full and strong, this being the normal and healthy condition.

Pericarditis

is a disease of the heart which may exist in either an acute or chronic form. It also may be either primary or secondary, as a rule following such diseases as pleurisy, pneumonia, or certain other contagious affections.

Symptoms.—There is a chill at the start, followed by nervousness and a feverish, restless condition. The temperature runs high, the visible membranes are dry and red to the eye, the skin also is hot, the pulse exceedingly quick, it running up as high as 100 per minute, about the record in the whole category of diseases. The affection, which by the layman may be mistaken for an attack of pleurisy, is a very serious one, the pain and shock being so intense that many patients die from the effect in the course of a very short time (a few days); however, it is not incurable, and the patient may recover even though for a time he would seem to be lost, the exudation becoming absorbed. After recovery from the main attack it is often the case that the heart remains weak for a considerable period, and there may arise complications with the lungs, such as edema, or cardiac paralysis, to which the patient eventually succumbs.

Treatment.—Let the patient have perfect rest and quiet. Call in a veterinarian at once, and let him direct the treatment. As soon as possible reduce the heart's action by the use of sedatives, such as aconite or veratrum. To quiet the bounding, excited heart the veterinarian's best remedy is opium, properly administered. If he finds that this does not have the desired effect in any special case, he may substitute chloral; carefully administered, in doses not too large. Locally warm applications over the heart and surrounding surface, such as hot blankets (wrung out of moderately heated water), may be used with good relief. You can hold them in place by putting a dry blanket over the wet one, and holding both in place with girths. It is also said that in special cases, where the temperature runs very high, cold, soothing applications over the heart region are good. In the case of man hot poultices and the oil skin jacket are used; this may be used with the sick horse or other animals with good results. For the fever use Bradbury's Brazilian Specific, which is excellent in such cases. As stated, however, this is too serious a disease for you to do any experimenting with, and you must have a veterinarian at the outset, to do the prescribing. Davis Veterinary Liniment, externally applied, often is of great benefit, and you ought always to have this at hand to be prepared for emergency.

Endocarditis,

another disease of the heart, which is also divided into the acute and chronic forms. The acute form consists in an inflamed condition of the lining membrane of the heart and the tissue that forms the valves of the organ. It shows itself by an impaired condition of the substance of which the tissue forming the valves is composed, causing

vegetations and similar disorders. The chronic form of the malady is simply where the foregoing affection attains a chronic character, gradually causing thickening, puckering, hardening and general deformity of the valve tissue and membrane.

Causes.—It is almost impossible to diagnose this disease in the horse while it lives, but it is ascertained that as a rule it is of a secondary nature, following such diseases as erysipelas, pleurisy or pericarditis; also rheumatism, which, however, seldom occurs in the horse. Or traumatic injuries, colds or certain infections may bring it about.

Symptoms.—There are no special distinguishing symptoms. As stated, it is, as a rule, a secondary affection.

Treatment.—Let the patient have perfect rest; add Davis Stock Food to the ration in usual proportion; let the diet be light, nourishing and easily digested, and if you have a veterinarian in the neighborhood call him in and consult with him. It is a difficult disease, and there is not much to be done in the way of treatment, except diet and rest, with ordinary hygienic measures.

Cardiac Hypertrophy.

In this disease we find that the muscular tissue which forms the walls of the heart has expanded or enlarged, at times interfering with the size of the cavities of the organ. This malady is divided into three forms, the simple, the eccentric, and the concentric form of cardiac hypertrophy; the first being indicated by an increased thickness of the walls without any change in the size of the cavities, the second is where the walls are thickened and the cavities enlarged, the third where the walls are expanded, but the cavities diminished in size. It will be of interest to you to know that the normal capacity of the heart is from 1 to 1¼ pints of blood, and that its ordinary weight is 6¾ pounds.

Causes.—There may be some affection of the valves on which the disease is dependent, or it may be due to overexertion on the part of the animal, enervation and debility, some form of obstruction to the pulmonary circulation, affections of the capillaries and arteries, or contractive disorders of the system.

Symptoms.—The heart beat is more bounding and fuller, there may be passive congestion of the lungs as a complication, or dyspnea (dyspnea means difficult and labored breathing).

Treatment.—Let the patient have perfect rest and recreation. Preferably turn him out in the pasture, if it be in the summer season of the year, and let him alone. If stabled, let him be quiet and comfortable, let the ration be wholesome and nourishing, and allow 2 tablespoonfuls of Davis Stock Food to each feed. By restoring equilibrium to the digestive, assimilative and circulatory functions you, as a rule, will be able to create health and harmony throughout the system, including all the correlated organs. In severe cases you should call in a veterinarian and let him prescribe suitable medicines, such as digitalis, aconite, ether, camphor, iodide of potassium, caffeine, etc.

Cardiac Dilation

is another of the several diseases of the heart characterized by extension or dilation of one or more of its cavities, the walls in this instance being either thickened or thinned. This affection is divided into two forms, dilation with thickening, and dilation with thinning, respectively. It is due to an impaired state of the walls of the cavities, and increased pressure upon them, and the only outward symptoms are a weak, rapid pulse, more or less distinct obstruction to the general circulation, labored breathing, and, at times, a tendency to dropsy.

Treatment.—You should look after the diet, making it of a wholesome, nourishing character, suited to the age and condition of the patient, allowing Davis Stock Food, 2 tablespoonfuls to each feed, as long as the horse is sick, and 1 tablespoonful to the feed thereafter, if you would keep him well. Do this in the case of all your horses, and disease will soon become a well nigh unknown quantity among them. If the case be a severe one you may give the sick animal stimulants, such as whisky or alcohol, administered in moderate quantity in its drinking water. Iron, arsenic, morphine and strychnine are recommended in special cases, and should be prescribed by a veterinarian. At times you will have to purge. Do not work the animal too hard—rather give him a rest and outing if the season permits it. In other words, turn him loose for a while.

or, simply, palpitation of the heart, is an irritated, excited condition of the organ, its beat becoming precipitated and hurried, its rhythm spasmodic or irregular and sometimes intermittent, which means skipping a beat between whiles. There may be an intermittent heart, where several beats are dropped, or there may be a rapid heart, sometimes occurring in a normal state from overexertion, fear, anxiety, etc., this is called tachycardia; and there may be a slowness of the action of the organ, often met with in convalescence from digestive disorders, fever, blood or circulatory diseases, this is technically known as brachycardia.

Causes.—Palpitation of the heart may be brought about by fear, anxiety, overexertion, nervousness, kicks, bites, blows, indigestion, liver troubles, irritation of the cardiac ganglia, and numerous other causes.

Symptoms.—The main symptom is the excited, nervous condition of the animal, and the rapidly pulsating or throbbing heart, which can be distinctly felt by placing your hand over it. In slighter affections it may be only a flutter, and in the most severe the beating is violent and persistent, throbbing, bounding and pounding away in an uncontrolled manner, the animal's breathing becoming labored, he losing all self control for the time being and appearing in the greatest agony and distress. All ordinary cases recover, if the general condition of the patient is good and there are no complications.

Treatment.—Do what you can to quiet and reassure the animal while under the influence of the attack. Then let his exercise be moderate, and see that he is fed properly with a view to strengthen and invigorate his entire system, which in some way must be at fault. Let the diet be nourishing and wholesome, and add Davis Stock Food to the ration as usual. In severe cases call in a veterinarian and let him prescribe suitable drugs. The medicines usually prescribed to alleviate this disorder are camphor, chloral, veratrum viride, valerium, etc. In special cases digitalis with nux vomica or iron, rightly administered, is beneficial.

Spasms. This affection is identical with what in man is called hiccoughs, and is indicated by sudden, involuntary, convulsive contractions of the diaphragm (the partition that separates the abdomen from the chest). There may be involuntary, convulsive movements of the entire body, associated with a thumping sound (giving to the disease the popular name of thumps). This thumping is so loud and audible that you often can hear it a considerable distance away from the patient, and there is a pronounced shock or series of shocks when you place your hand over the diseased parts.

Causes.—Sometimes it is due to nervous afflictions or certain diseases of the general system, and at other times we find it to be brought about by overwork or overexertion, such as fast driving, riding, etc. Again, it may be caused by irritation to the diaphragm produced by such agents as cold drinks, overloading of the stomach with food, inflammation, colic, etc. All you can do for the patient is to feed and treat him well, allowing Davis Stock Food with a nourishing ration; do not work him too hard, preferably giving him a rest with an outing, liberating him in the pastures, and, if the case be severe, give him a stimulant in his drinking water—whisky or plain alcohol. Do not do this except preceding or following an attack.

Rupture of the Diaphragm. Flatulent colic may produce this, the gas or wind pressing on the organ until some weak spot in it gives way, or it may be brought about by violent external movements, such as a forced ride, the animal throwing itself down in an abrupt, violent manner, etc. Or wounds penetrating the organ may produce it, as well as general weakness and debility of the system, reacting upon the tissue and substance of the diaphragm.

Symptoms.—The breathing is labored and difficult, the patient will endeavor to attain a position, sitting on its haunches or lying on the sternum (the breast bone). Signs of collapse shortly appear, the pulse is weak and rapid, the extremities change from warm to a cold sweat, the breathing is more labored, the nostrils distended, eyes staring and anxious. The pain is intense, and continues until death in the course of a few hours relieves the sufferer. All you can do in the way of treatment is to try to relieve the agony by the free use of opium or morphine, ether or chloroform.

DISEASES OF THE NERVOUS SYSTEM.

Various technical terms are used to describe the several forms under which disease of the nervous system manifests itself in the horse. For our purpose it is only necessary to mention the most common of these, and give a brief definition of their special nature and the conditions under which they appear. Thus in delirium we have a disorder of the nervous system which, so far as animals are concerned, can only be defined by saying that it is associated with and manifested by incoherent and extraordinary acts on the part of the patient. Hyperesthesia expresses an enhanced excitability or sensitiveness throughout the sensory organism. In hyperalgesia we have a state denoting tenderness, or a predisposition to the kind of pain we designate as tenderness. Paresthesia is the name given to the sensations or sense waves which from the central station in the nervous system are dispatched outward to the surface, to be caught up by consciousness and become expressed. Such sensations are pain, heat, cold, or any agent in nature impressing itself upon the nervous system vehemently enough to cause a response. By anesthesia is meant a breaking down or interruption of the conducting power of the sensory nerves, bringing about a more or less complete loss of sensibility on the surface of the body.

Coma is that certain state of the mind shading from consciousness into unconsciousness, a kind of deep sleep from which the patient either cannot be aroused at all or else is only aroused with much difficulty and effort. We divide coma into two forms, carus and sopor. The first (carus) designates the condition from which we cannot arouse the patient, this being also denominated profound coma. Sopor is a semicomatose condition, from which we may be able to revive the patient.

Causes.—It is brought about by certain defects of the nervous system or brain; often we find it to be caused by lack of a sufficient supply of oxygen to serve the brain substance. Among the nervous diseases with which it is associated may be mentioned epilepsy, and all forms of neurosis. Or we may at times find it associated with other affections of the general system, liver, kidney or wasting disorders. As is well known, we can produce the condition by artificial means, such as ether, chloroform, opium, alcohol, and so on.

Treatment.—You should try to find out the cause that lies back of the phenomenon, and direct your efforts to remove and cure this, when the sleepy, comatose condition of the patient as a rule will disappear also. If you are unable to find the local trouble, or the defect in the general system which underlies the condition, you should try to overcome it by a strengthening, stimulating diet, adding Davis Stock Food in the usual way to the ration. This will, with enhanced digestive and assimilative activity, cause a greater flow of rich, red blood to be sent through the veins, entering the brain and nerve centers, finding the seat of the trouble wherever it may be, and centering around it until it is removed. This is nature's way of overcoming diseases of all kinds. The blood is sent in largely increased volume to any part of the system the moment an injury or disease affects it, and it is the duty of the blood to continue to centralize its revitalizing energies around this spot until recovery takes place. If the condition of the animal is good, and the resistive powers or reserve force of energy and vitality are up to the standard demanded by a strong, healthy body, it will perform its work of restoration and healing in a satisfactory way. This holds good of both nervous and physical disorders. And it is only through the stomach—through the agencies of digestion, assimilation and circulation—that such power is acquired. Therefore, keep these functions up to the highest possible degree of perfection by the regular use of Davis Stock Food with the ration, and be rewarded by strong, healthy, vigorous animals, full of vitality and resistive energy, able to cope in an emergency with any form of disease. It will pay you.

Staggers. This may be defined as a certain disordered condition of the nervous system, causing fits, nerve storms, dizziness and vertigo. It is a defect in balance in some part of the nervous equilibrium.

Causes.—There is a defect in some part of the nervous system, the brain or spinal cord; or it may be the optical nerve which is at fault. This making the eye the seat of the disease; while in other

cases we find that long confinement in dark, damp and badly ventilated stables may bring about dizziness and vertigo. Sometimes the climate is responsible, and sometimes a plethoric condition with insufficient exercise produces it. Again we often find it in horses used as motor power for machines, compelling them to travel round and round; or it may occur in horses while confined in railroad cars or on board ship, shipped from one point to another. If the harness fits the horse badly, causing the throat-latch or collar to press on the jugular vein, it may bring on an attack of vertigo. Hereditary tendency in some instances is responsible. It may follow pregnancy, or may be caused by parasites in the blood vessels or pressure on the blood vessels. Horses known as star gazers (horses with long, narrow necks, holding their heads high) are especially liable to the disease. In some animals it may be periodically recurrent, while others may have one attack, and never be subject to another.

Symptoms.—All of a sudden the horse will stop, look surprised, shake its head as if an insect had gained entrance to the ear, look about it in an anxious, trembling way, and if the attack is a severe one fall to the ground. In another form of the affection, called running staggers, the patient, if at liberty to do so, will run about in a semicrazed way, and is likely to hurt itself or do other injury if not restrained. It may recover shortly, but if care is not taken, and the patient put to work or driven soon after an attack, a second and third paroxysm may follow in the course of a very short while. The animal is more apt to contract the disease when harnessed up or saddled than at other times. It is not an especially dangerous disease if there is no chronic nervous defect or other organic trouble of an incurable nature back of the spasms.

Treatment.—All you can do during the attack is by all means to keep the patient as quiet as possible and keep it from hurting itself or its surroundings. Cold water or bandages applied to the head should be administered, the harness removed if possible, and a moderate dose of bromide of sodium or potash is good in some instances, but not absolutely necessary. In fact, if only you keep the patient quiet and constrained, applying the cold water bandages to the head, the attack will pass away of itself in the course of a short while. Do not scarify or bleed. Bleeding may be resorted to in the most severe cases, where there is one paroxysm after another, but if you are not skilled in the operation you should let a veterinarian do it for you. After the attack you may give the patient a good purge of calomel (one drachm) and aloes (seven drachms), to clean out the bowels, where often the seat of the trouble is located. Regulate the diet, do not scare or otherwise excite the patient unduly, and as a tonic and builder of the general nerval and physical strength and energies use Davis Stock Food, 2 tablespoonfuls to each meal until the attacks subside, then 1 tablespoonful to each meal, to insure the permanency of the recovery. Be sure that the harness fits the horse properly, and that he has plenty of fresh air and exercise in the open.

St. Vitus Dance. Chorea is the name the scientific world gives to this peculiar malady, while in common parlance it has been fitly called insanity of the muscles, stringhalt, or twitching disease. It is caused by certain defects in the nervous system, causing temporary lack of control of the voluntary muscles, with involuntary contractions and movements, giving the disease its name. The exact cause is not ascertained, but young animals in delicate health are more subject to it than others. Older ones, however, are not by any means exempt, but frequently attacked. It is said in some instances to have been produced by punctured wounds in the feet. It is, however, safe to assume that some hidden defect in the central nerve centers is in the majority of cases responsible.

Symptoms.—There are more or less twitching and contraction of the muscles about the lips, eyes, feet, shoulders, and anterior parts. Sometimes it may be the posterior or hind quarters that are subjected to the paroxysms, and then we call it stringhalt in the horse. If you suspect that the animal is suffering or about to suffer from an attack of stringhalt, but are not positive, you may make sure of it (in case he is stalled) by simply moving him from side to side, or you may take him out and trot him or turn him around suddenly and sharply, when the visible symptoms will appear. If it be due to some chronic defect of the nervous system, which most often seems to be the case, there is not much hope of recovery. On the other hand, if a wound or puncture of the feet is responsible, complete recovery will ensue in the course of a week or two. Under no circumstances is the disease likely to be fatal in its termination,

but may affect the animal throughout a lifetime, to some extent impairing its general health and usefulness. If, however, you keep the horse in perfect physical and nerval condition, by allowing it a nourishing ration with Davis Stock Food regularly added, you may practically overcome the effects of the disease, rendering the resistive powers of the animal strong enough to successfully cope with and overcome the attacks.

Femoral Cramp, otherwise known as cramp of the patella muscles, is another nervous affection of more local than general nature, and is evidenced by spasms and contractions of the leg muscles, the patient being unable to stretch or extend the affected member while the attack lasts. It may be brought about by some kind of irritation to the nerves of the parts, caused by strain or overwork of the muscles.

Symptoms.—The attack comes on suddenly, especially after the horse has been stalled, or after it has stood at rest for a little while. The member affected is stiffened, and looks as if it is longer than the other legs, knuckling at the fetlock follows, and the horse lifts the leg so as to rest only on the toe. It is almost impossible for the patient to move either forward or backward, and if he should be compelled to do so he will hump along on the three legs, dragging the injured member after him. The disease usually occurs in the muscles of the thighs of the fore legs.

Treatment.—A stimulating liniment, such as Davis Veterinary Liniment, applied to the parts at fault, with a little rest and special care, will, as a rule, bring the patient about. Sometimes the trouble may be associated with a disordered condition of the bowels, and a good purge or laxative may bring prompt relief. Let the ration of the patient for the time being be confined to soft and easily digested foods, such as succulent grasses, vegetables, bran mashes, always adding Davis Stock Food in the prescribed proportion.

Catalepsia is another condition where the nerves controlling certain leg muscles are at fault. There is a stiffening of the voluntary muscles, causing them for the time being to lose their contractive suppleness and power. Subjected to this condition the patient loses control of the leg, and when it is placed in any special position it remains stationary there until the condition is relieved. It is a rare disease in the horse, although Germany records it among equine diseases.

Epilepsy, or fits, is rarely met with in the equine family. It is a disease of the nervous system causing unconsciousness in the patient while the attack lasts, and there may or may not be convulsions. It is so seldom met with in the horse that in mentioning it a brief paragraph in these pages would seem to be sufficient. A very few cases among stallions are recorded. The dog, among domestic animals, is the one most subject to the disorder. It is caused by certain impairment to or defect in the nervous system. Among the medicines used in combating it may be mentioned alcohol, turpentine, digitalis, chloral, bromides, and cold applications to the head. If the animal is kept in good general condition by proper feeding, including Davis Stock Food, it is insured against attacks of this and allied affections of the nerves.

Cerebral Congestion means congestion of the brain, and is technically known as cerebral hyperemia. It is caused by a superabundant flow of blood to the brain, congesting the blood vessels of that organ and interfering with their proper functioning. There are two forms, called the active and passive form; the former indicating a condition in which the flow of blood to the brain is too abundant, the latter, one in which, on account of some local obstruction, the blood is dammed up and forced to collect in the brain vessels. The active form preferably appears among young, full blooded (plethoric) animals. Certain drugs, as, for instance, opium, may cause it; and hard work in the hot sun, or the sudden removal of an animal that for some time has been confined to a dark stable to the light and sun may bring about an attack. It is a rare affection in the horse. If the attack is not associated with chronic disease of the nerves or other organic troubles, the patient, as a rule, will completely recover. There are no special symptoms to show the existence of this affection in the horse.

Treatment.—You may not know expressly that your horse suffers from congestion of the brain, but if the disease or any other form of brain disease is present you will be quite able to see that something is the matter with the head of the animal. Numerous symptoms will indicate this, and as soon as this

is brought to your attention, no matter what is the special name given to the malady, you should make the patient quiet and comfortable in a box stall, where he is left to himself, and where there is plenty of fresh air. Then you should purge and act on the bowels with a view to drawing the surplus blood from the brain and relieving the congestion; a light, wholesome diet, adding Davis Stock Food in usual proportion to the ration, aiming at restoring a perfect digestion and circulation of the blood, will soon bring relief. Meanwhile you may soothe and comfort the suffering animal by applying cold applications to the head at frequent intervals.

This is the opposite of the foregoing condition—a diminished and insufficient flow of blood to the brain. General debility of the system, severe hemorrhage in some part of the body, or an inflated and distended condition of the blood vessels in other parts, may be responsible. The affection is also called anemia of the brain.

Symptoms.—The general symptoms by which vertigo is characterized as a rule attend this disorder. There is considerable nervous excitement, restlessness and dizziness, and if able to do so the patient will continue to walk backward and forward for long spells at a time. Sometimes we find twitching of the muscles of the neck and head. If the affection is not caused by chronic disease, nervous or physical, recovery as a rule is prompt.

Treatment.—You should constrain your efforts to try to build up the general system by hygienic measures and proper feeding. As the animal suffers from a lack of blood it is self evident that this must be counteracted by a wholesome, nourishing ration, tending to bring him back into condition as promptly as possible. Do this, and add Davis Stock Food to the ration in the usual proportion (2 tablespoonfuls to each feed while the horse is still sick, and 1 tablespoonful after recovery has taken place, to insure permanency of the good done), and, with the improved digestion and assimilation, the blood will soon flow freely and abundantly through the veins to the brain and all other parts of the body. The horse will be perfectly well in every respect.

or hemorrhage of the brain, is caused by one of the blood vessels of the brain becoming ruptured, followed by a state of paralysis and coma. The disease is known under a number of other names—encephalic hemorrhage, intracranial hemorrhage, meningeal hemorrhage, cerebral apoplexy—but the cause is the same in each instance, as is the nature of the affection.

Cerebral Hemorrhage,

It may be the result of a general plethoric, apoplectic condition of the system, or there may be an injury to the skull, a fracture and the like, the walls of the blood vessels may have become diseased, causing the breakdown, or there may be overaction on the part of the heart. It is more common in old than in young horses.

Symptoms.—Primary and secondary; in the first instance (primary stage) we find restlessness, nervousness, uneasiness, vertigo, twitching of the muscles of the head, and in cases where much blood is lost there may be paralysis and coma. The patient breathes heavily and with difficulty, pulse is weak and slow, the breathing is deep, snorting or stertorous, nostrils and pupils dilated, eyes turned and lifeless in their sockets, involuntary urination, involuntary action of the bowels, paralysis at times of a certain part of the body, according to the situation of the ruptured vessel. As secondary symptoms we find that, along the course of the nerves which have become paralyzed by the rupture, a rapid change is taking place in the tissues. Semiparalysis or complete paralysis follows the course, sometimes with more or less atrophy of the muscles. We distinguish between cerebral congestion and cerebral hemorrhage by noting that in the first case the symptoms which are permanent in the second are only of a temporary nature (loss of consciousness, paralysis, etc). Cerebral hemorrhage generally is incurable, it becoming necessary to destroy the patient if death does not ensue as the natural termination of the affection. Mild cases, however, may survive, with paralysis of certain parts remaining. All you can do in the way of treatment is to try to reduce the amount of blood flowing toward the ruptured vessel, and thus put an end to the bleeding. If you have a veterinarian conveniently near at hand call him in and benefit by his counsel. If the horse survives, let the diet for a while be very light, and add Davis Stock Food to the ration, 2 tablespoonfuls, as usual. Purges may be of benefit. The veterinarian probably will prescribe colchium or iodide of potassium as internal medical treatment, and that is all that can be done for the animal.

Cerebral Embolism.

Where the blood vessels of the brain become plugged or stopped up by any foreign substance it is called cerebral embolism. The symptoms are convulsions, loss of consciousness, paralysis, etc. Another form of the affection, called thrombolism, indicates a condition where the circulation of the blood in the brain vessels is partially or wholly obstructed by blood that has coagulated and congested in the vessels and veins. It may be caused by a minute calcareous body which has found its way into the blood and around which the blood tends more and more to coagulate until the obstruction occurs; or the obstruction may be caused by a thrombone, or by vegetations from the heart valves, which have been washed along with the blood. General debility of the system, impaired vitality and sluggish general circulation predispose disorders of this nature. Thrombosis we find as a rule to be caused by some vascular affection.

Treatment.—All you can do to relieve the affection is to look carefully after the diet and general hygiene of the affected animal, adding Davis Stock Food to the feed regularly until the digestion and assimilation improve and cause the circulation of the blood to act normally and healthily, and flowing freely and unobstructedly through all the vessels and veins of the body, meaning health and renewed energy and vitality.

Cerebral Dropsy,

technically called hydrocephalus, is divided into two forms, congenital hydrocephalus and acquired hydrocephalus. In the first instance we find the so called cerebrospinal fluid in the ventricles of the brain, or meshes of the pia mater in the young, present in too large quantities, and there is a visible enlargement of the head, with disorders of the nerves of a more or less pronounced nature.

It occurs at the time of birth, often making delivery difficult, but is not so common in foals as in calves, and only deserves mention in the case of acquired hydrocephalus, which is a chronic brain affection, the fluid collecting in the ventricles and congesting them more or less, resulting in peculiar phenomena, such as a marked difference in the consciousness, sensibility and conception of the patient, distinguishing it from the normal animal. Such a patient is generally called a dummy. It may be caused by hereditary predisposition, and it is better not to breed such animals at all. In other cases, however, we find it a secondary affection, following the usual forms of inflammation and congestion of the brain. Or it may be brought about by poor food, neglect, overwork, ill fitting harness, exposure to the hot rays of the sun, etc.

Symptoms.—The symptoms vary according as the patient is in motion or resting. If confined in the stall the disease is indicated by the peculiar position the horse prefers to stand in, placing himself in a diagonal position, hanging his head down, or resting it on the manger, appearing dull and listless, and paying no heed to the flies that pester his body, or to the whip. If you take him out to drink he is apt to plunge his head to the bottom of the trough, take a swallow or two, then raise the head and sniff the water about him. In masticating his food he will grind away for a brief spell, then stop and look puzzled, as if thinking over something, and the food in the mouth will be expelled and drop to the ground. The patient may waver between an excited, scared condition, with now and then paroxysms of great fear, later changing to a comatose condition with stupidity and indifference to his surroundings. When he is in motion we find the head bent low to the ground, the feet raised abnormally high, resembling in some respects the gait of a blind horse, carefully finding his way. Now he stumbles, stops or walks slowly, balks, or refuses to work altogether. If you try to back him, he offers resistance, with the result that the feet are drawn after him, making a tear in the soft ground on their way. The pulse both when at rest and in motion is slow, say twenty to thirty beats per minute, the bowels generally costive and torpid, but the general condition surprisingly good, the patient as a rule looking fat and sleek. The symptoms are more pronounced in hot than in cold weather. The trouble generally is incurable, although the horse may not be absolutely worthless.

Treatment.—All you can do in the way of treatment is to look carefully after the diet and hygienic conditions of the patient, let his work be moderate and regular, the feeding systematic, and aiming at building up his general health and strength, keeping the circulation and digestion in good order by the regular use of Davis Stock Food. If there are frequent paroxysms, bleeding and purging may become necessary, and in some cases you may have your veterinarian prescribe a short course of medical treatment, using diuretics and absorbents, potassium iodide, potassium bromide, etc.

There are a series of diseases affecting the horse in such a way that the owner will find him down and either wholly unable to rise or else only able to do so with great pain and effort. We will here, in conclusion, mention a few of the most common of these, including spinal meningitis, apoplexy of the spinal cord, cerebrospinal meningitis, azoturia, paralysis, myelitis, etc. This condition should be distinguished from that of the so called malingerer, which means a certain cunningness or cussedness on the part of the animal, making it simulate disability in order to shirk working.

In summing up let us but add a few brief definitions of diseases which as yet have been but insufficiently enlarged upon, giving their name and nature: By paralysis is meant a condition in which the voluntary and involuntary movements of the muscles are lost, due to impaired innervation, which means a diminished supply of nervous energy being supplied to the parts on account of some injury to the centers from which the nerve fluid flows. Myelitis indicates an inflammation of the substance of the spinal cord, with paralysis of the posterior or hind parts, the bladder, rectum, etc. In crossed hemiplegia we have a form of paralysis in which one side of the body is deprived of its nervous and muscular energy. Apoplexy of the spinal cord is a suddenly appearing hemorrhage, into the substance of which the cord is composed, with spasms of the muscles, paralysis and at times hematuria. A malingerer, as indicated above, is a horse simulating disability or disease, lying down and refusing to rise, even under the whip. Spasm indicates a state under which the muscles for the time being are beyond the control of the patient, there being more or less violent contractions and movements not guided by volition. We divide spasm into two forms, called tonic and clonic spasms, respectively, the former describing a condition where the involuntary contractions of the muscles continue uninterrupted for some time; the latter is where the contractions are not constant, but attacks follow in rapid succession; it may be either a local affection or one of the general system. Cramp is so called tonic spasms of the muscles, accompanied by pain of an intramuscular nature.

Spinal Meningitis

indicates an inflamed condition of the spinal cord, associated with loss of power and feeling in the hind part of the body, the legs, thighs, etc. It is caused generally by neglect, overexertion, bad hygiene, heat and a low state of vitality. The exact cause has not been clearly defined up to the present day, and some writers would have it that a special germ is to blame. There is a loss of power of the hind parts, the legs and thighs, and it is almost impossible to back the animal or turn it, the legs do not work well together; the patient staggers and looks about it in a helpless way, drags the toes of the hind legs after it, and may fall down and remain on the ground in a helpless condition. The tail hangs limp and lifeless, and, if you catch hold of it and raise it, it falls back in position in a nerveless way. The temperature runs from 101 to 102 degrees Fahrenheit. The treatment is to place the patient in slings, and if you do not know how to do this yourself, call a veterinarian and let him show you. Also give a purge, and then a moderate dose of belladonna, repeating every three or four hours, until the purge is acting nicely. Strychnine should be given, one-fiftieth of a grain at a time to start, increasing little by little until its action becomes visible. The urine should be drawn off every day, and enemas given to assist the purge; also apply good liniments, such as Davis Veterinary Liniment, to the diseased parts. Massage, manipulate and gently exercise the horse in order to gradually bring life and circulation into the stiffened muscles. Give Davis Stock Food regularly with a light nourishing ration, in order to regulate the digestion and circulation. Let a veterinarian show you in regard to the medical treatment advised, so that you shall make no mistakes.

Sunstroke.

This well known affection is caused by overheating, especially by prolonged exposure to the hot rays of the sun in summer, or exposure to excessive heat of any kind, reacting upon the nervous system, causing the peculiar phenomena we designate sunstroke. This affection is also called thermic fever, and is divided into two forms, sunstroke proper or thermic fever, which is caused by overwork or prolonged exposure to the sun in summer; the other form we denominate heatstroke or heat exhaustion, which is a condition arising from exposure to any kind of heat, artificial, or the rays of the sun. The symptoms are sudden when exposure to the sun is the cause; the breathing of a sudden becomes labored and difficult; the patient looks uneasy, staggers and sinks to the ground, remaining prone and helpless. Pulse is weak, temperature quickly runs up to 104 to 107 degrees Fahrenheit; there may be entire or partial

insensibility or loss of consciousness; bowels become constipated, urine scant, the brain is affected, and symptoms like those attending on apoplexy may show. Pupils of the eyes are staring and dead, insensible to light; blood vessels of head and neck are full and throbbing; breathing becomes snorting, stertorous, and more and more labored, and there may be spasmodic contractions of the muscles, and at times convulsions. In heat exhaustion, on the other hand, we find that the principal symptoms are weakness, with a feeble pulse, rapid breathing, high temperature, and general debility. As a rule the patients recover, but secondary diseases, congestion of the lungs, stomach disorders, lameness of certain parts, etc., may result.

Treatment.—Remove the animal from the exposed condition; take it to a place that is cool, shady and comfortable, keep it quiet and ease the pain and fever by cold water applications to the head and body, injecting a quantity also through the rectum, doing it all as gently and soothingly as you know how. Stimulants, a little whisky or alcohol in the drinking water, may be used afterward, or brandy hypodermically injected. If the case is a very serious one ether or chloroform may be necessary, but then you should call in a veterinarian and let him administer it. Belladonna, nux vomica, quinine, etc., to counteract the effects of the heat and tone up the nerves, are also recommended. And in some cases purging and bleeding may be resorted to. In all severe cases, which you feel that you are unable to handle yourself, call in a veterinarian, as already advised. Keep the digestion and circulation of the sick animal in order by the use of Davis Stock Food in the feed ration.

Azoturia,

or Spinal Typhus, is indicated by the dark color of the urine, resulting from a hypernitrogenized condition of the blood and an abnormal dropping of the hind parts, the legs and thighs, there being more or less knuckling at the fetlock. The disorder is also denominated rheumatic paraplegia. The cause of the trouble is not well determined, some saying that the liver is at fault, others the kidneys, skin or nerves. It is also possible that too highly nitrogenized feed, supplemented with insufficient exercise, is to blame. We find it most often during the cold spells of weather, in heavy draft horses, and especially after the horses have been put up during holidays, fed in the same way as when they did heavy work. They may be high spirited and gay when thereupon you take them out of the stable, kicking and prancing so that you can hardly control them, and go on in this way for a mile or so up the road, when of a sudden the one affected with the disease will slow up and fall behind his companion, stagger and fall over, unable to rise himself again. Or again, he may get lame, perspire profusely, look nervous and restless, watch his belly interestedly again and again, until you think that he is subject to a bad attack of colic, but in your attempt to make him move you will find that he has lost control of the muscles of one of his legs, also becoming aware of the knuckling at the fetlock. You may then think that he has picked up a nail on the road and examine him for this, but without result. If you have any doubt as to what the disease really is the dark color of the urine should tell you; it is of a brownish coffee color, in some instances pitch black. Pulse becomes full and leaping, temperature runs up to 102 or 103 degrees Fahrenheit, and the breathing may become rapid and labored.

Treatment.—As yet no remedy has been discovered that will successfully cope with this affection. Bleeding, if it were possible, might be good, and is recommended, but it is not an easy operation to perform with the horse thrashing madly about on the ground, difficult to get near. The operation relieves the congested blood vessels, thus quieting the animal, reducing the fever, and then medicines and other ministrations may be administered. Chloral hydrate may be given the agonized, thrashing animal to quiet him in the first instance. You should, if you have a veterinarian conveniently near at hand, send for him, meanwhile doing what you can yourself to relieve the sufferer. Strychnine or other nerve stimulants are recommended after the first attack has subsided, and may be administered with good results. Slings may be resorted to, but it is best not to use them, except in milder cases where the patient is able to rise himself and stand. Otherwise they are likely to sag out of the sling, thrash wildly about, perspire, kick, bite and carry on in such a way that you will have to liberate them. Most of the patients die, although the milder cases have a chance for life. Paralysis of the muscles of one leg, or spreading from one leg to another is likely to result in those that recover.

Call in a veterinarian, as suggested, and abide by his advice. Always examine the urine, and this should be drawn off with a veterinarian's catheter at least once in twenty-four hours. If there be spasms of the muscles of the penis, making it difficult or impossible to insert the instrument, put your hand and arm into the rectum and press on the bladder; this as a rule will enable you to draw down the penis and introduce the instrument, or there may be a urination without the use of the catheter. In serious cases the bladder should be washed out with warm water and boric acid, quinine, Phenalin, bichloride of mercury, etc. Hot blankets applied to the loins and hind parts are good. Do not blister. Keep the patient quiet and comfortable after the first attack has subsided; a good soft straw bed, give soft feed, and Davis Stock Food, 2 tablespoonfuls to each feed; also all the water he will drink. If he is down and unable to rise, turn him over from one side to another every twelve hours or so to keep him free from uncleanness.

In the preceding pages the intelligent, up to date horse owner will find such practical advice and easily applied methods of treatment, as will enable him not alone to take care of his sick horse in emergency, but to diagnose and cure all milder cases that may occur among his animals, no matter what the nature of the trouble may be. The remedies and methods given for treatment are those employed by the best and most skilled veterinarians in the world, being laboriously compiled from the standard works and text books on equine veterinary science.



DISEASES OF CATTLE.

ADMINISTRATION OF MEDICINES.

Medicines may be given in different ways, and it is therefore well to consider in detail the most common methods of administering them to bovine animals.

By the Mouth. You may give them by the mouth in the form of drafts or drenches, powders, electuaries, and balls or pills.

Drafts or Drenches is the form in which medicine is usually given to cattle. Dissolve the medicine in water or any other suitable liquid. Soluble medicines should be well shaken up with the liquid in which they are given, so as to insure their complete solution. For example, if you give an ounce of sweet spirits of nitre, the medicine should be shaken up with at least half a pint of water before giving it. If you give the medicine without diluting it, a sore and inflamed condition of the mouth is produced. The materials which enter into the composition of some drenches are not soluble, that is, no amount of shaking will dissolve them in the liquid in which they are given. As examples of such medicines we mention powdered ginger, powdered gentian, and carbonate of iron, but by shaking they may temporarily be suspended in the liquid in which they are given, so that by agitating such medicines while in the act of giving them they are temporarily mixed with the liquid and may consequently be given as a draft, though not quite as easily as medicines that are soluble. In giving drenches you must always ascertain to what degree the medicine or medicines composing the drench should be diluted. If you are careless in this matter, dangerous and even fatal consequences may ensue, and it is well to make it a rule not to give medicines unless they are prescribed by some one who is competent to give directions in such matters. This rule, of course, will not apply to those who possess sufficient knowledge of medicine to prevent mistakes being made. In giving a drench to an ox the hand should be passed in front of the horns and the fingers take hold of the partition between the nostrils; the nose should be raised in a slightly upward direction, and the neck of the bottle should then be introduced at the side of the mouth so as to allow the medicine to flow gradually out of the bottle. In doing this do not twist the neck of the animal to the side on which the person administering the medicine stands, and do not raise the nose higher than is necessary to allow the draft to flow easily down the throat. The neck and head should form a straight line of which the nose is the highest point. If the animal resists, let an attendant hold it by the horns, so as to steady the head. If the animal tries to cough, release the head for two or three minutes.

Powders should be pulverized or finely divided, and also should be well mixed together if there are several ingredients in the powder. Do not make up powders of materials which will cause irritation of the mouth, or which have a disagreeable taste.

Electuaries are often used in treating sore throat, or for cough. They are usually composed of a powder, such as chlorate of potash or alum, which is rubbed into a thick paste with syrup or molasses and is then smeared on the animal's tongue with a flat, wooden spoon. But any powder may be given as an electuary so long as it is not possessed of caustic or irritating properties. Balls or pills are not well adapted for the treatment of diseases in cattle.

By the Bowels.

How Medicines are Injected.—The mouth may be swollen or otherwise affected, making it impracticable to administer the medicine that way. If such be the case the agent to be used, after proper dilution, may be given by the rectum; in which case, however, as a rule, a double dose is required. Before giving medicine this way, empty the rectum by a warm water injection. Enemas, or injections, are also used in cases of constipation. Put the hand in the water before injecting, and if pleasantly warm it is of the right temperature. About 2 quarts should be used for an injection. A little soap may be added to stimulate the action, but the water will be retained longer if the soap is omitted. Suppositories also are sometimes used, and are deposited in the rectum. Before the suppository is introduced the rectum should be evacuated.

Vaginal Injections.

Inflammation may occur in the vagina from various sources. In such cases dissolve the antiseptic or healing agent in tepid water and apply once or twice a day with a syringe. When the cleaning (placenta) has been retained in the womb, instead of coming away shortly after calving, a discharge will set in, commonly known as the whites (leucorrhœa). In such cases wash out the womb daily with a 1 per cent solution of Phenalin by connecting a long, flexible tube with a syringe, which is passed by the hand into the mouth of the womb so as to wash out and cleanse, setting up a healing action.

By the Nose.

Vapors and volatile agents, capable of being diffused in the air, are sometimes administered in that way; for instance, when the bronchial tubes of young cattle are infected with worms. Chloroform and sulphuric ether are among the agents administered that way. If a cloth is saturated with chloroform or sulphuric ether and applied to one of the animal's nostrils while the other nostril breathes air, the vapor will pass through the nostrils into the lungs. The wet cloth applied to the nostrils should be covered with a dry one, folded several times over itself, to hold the vapor. The methods of injecting medicines by the windpipe or veins should only be applied by veterinarians.

Treating by the Skin.

The appliance of medicine to the skin is used chiefly in parasitic diseases, the aim being to destroy the parasite. Ointments, enabling the operator by rubbing to work the medical agent thoroughly into the skin, are preferable. When poisonous agents are used, the animal may lick itself after the application and become poisoned. Therefore avoid poisons such as mercury and arsenic. These poisons may also work destruction by coming in contact with raw patches of skin and being absorbed into the system. Beware of them. Always wash the skin well with soap and water before applying the ointment, so as to remove scabs. In neuralgic or irritating forms of skin diseases, local applications are of great service in allaying irritation and pain. At times medicines are injected beneath the skin so as to be absorbed and pass into the blood. This method is being more and more used, and often proves of great service. But it requires a veterinarian to apply it.

DISEASES OF THE MOUTH.

Inflamed lips, produced usually by a blow from the horns of another animal, or in case of working oxen, by the driver, are frequently encountered. Again, grazing cattle, especially when pastured in woods, may be bitten by serpents, etc.

Symptoms.—Lips become thick and swollen, and, if neglected, the swelling becomes hard and indurated, rendering it difficult for the animal to eat, the lips losing their flexibility. In such cases an ox will protrude his tongue, endeavoring to get feed into the mouth by that organ. The swelling in case of snake bites is soft and comparatively painless.

Treatment.—Bruises, easily distinguished from snake bites by the different train of symptoms produced, should be bathed steadily for three or four hours in the following solution: Davis Veterinary Liniment, 6 tablespoonfuls; water, 1 pint; or muriate of ammonia, 1 ounce; water, 2 pints. In older cases rub the swollen part every day with Davis Veterinary Liniment, or every other day with oil of turpentine

until swelling subsides. In snake bites a straight incision, penetrating into the flesh or muscle, should be made across the center of the wound, and then a similar incision, but passing crosswise of the first, should be made. Then press a small wad of cotton batting against the wound until the bleeding almost stops. Now apply Davis Wire Cut Remedy, or, if not at hand, the following lotion several times a day: Permanganate of potash, $\frac{1}{2}$ dram; distilled water, 1 pint. Doses of whisky are recommended when the bite is followed with stupor or depression. Half a pint of whisky with a pint of water may be given. Repeat the dose in half an hour if the animal is sinking into a stupefied, unconscious condition. Repeat until this condition is overcome. Remember the object is to ward off stupor, resulting from snake bite; stimulation, and not intoxicating effect, is what is aimed at.

Salivation is a symptom of some general or local disorder, in some cases being the symptom of such general diseases as for instance rabies, and in others purely local, as when copious secretions of the glands are produced from eating irritating plants. When saliva is observed dribbling from the mouth, examine it carefully by introducing an instrument like a balling iron into the mouth, or, if such an instrument is not at hand, grasp the tongue and partially withdraw it from the mouth, exposing all parts of the mouth to good light, so that any foreign substance present may be detected. Whatever this may be it should be carefully extracted. Another cause of salivation is cattle, which have been rubbed with mercurial ointment, licking themselves. Do not use such ointments.

Treatment.—If salivation is caused by irritation or inflammation due to acid plants or forage, a lotion composed of 1 ounce of powdered alum dissolved in 1 quart of water should be syringed into the mouth twice a day, using $\frac{1}{2}$ pint of the lotion each time. If caused by the presence of thorns, splinters, wood, etc., imbedded in the cheek or tongue, remove object and wash the mouth occasionally with a weak solution of Phenalin and tepid water. When produced by poisoning or by the foot and mouth disease, special treatment, appropriate to those general conditions of the system, as well as the local treatment, must be applied. Davis Phenalin, when used in accordance with the directions, is the best remedy in the world for this trouble.

Irregular Teeth. This condition may be occasioned by the unequal wearing of some of the teeth or by some of the incisors being broken. The molar teeth also may show irregular wear. Their edges may become sharp, or it may happen that a molar tooth has been accidentally fractured. It also may occur that a supernumerary tooth has developed in an unusual position, interfering with the natural and regular mastication.

Treatment.—You may examine the mouth by grasping the animal's tongue with one hand, partially withdrawing it from the mouth, so as to expose the incisor and molar teeth to inspection. When it is desired to examine the molar teeth with the fingers, an instrument like the balling iron used for the horse should be introduced into the mouth, so as to separate the jaws and keep them apart while the examination is being made. All sharp edges of the molars must be removed by the tooth rasp. Supernumerary teeth, interfering with mastication, should be extracted; also any tooth which is fractured or loose. In performing such operations it is best to throw or cast the ox, holding its head securely, so as to enable the operator to perform his work.

Caries of the Teeth may be suspected if the mouth exhales a bad odor, and if the animal occasionally stops during mastication, as if in pain. The existence of caries in a molar tooth may be ascertained by examining the mouth in the manner already described. If one of the molars is found to be carious it should be extracted, if the caries is so extensive as to render other means of treatment impracticable. If the crown of the tooth is destroyed and only the stump or root left, extraction will be impracticable. In such cases the best way is to sell the animal to the butcher.

Actinomycosis of the Jaw Bone, popularly called Big Jaw or Lump Jaw, first shows itself by a swelling or enlargement of the jaw bone. The affection may be distinguished from that produced by a contusion or blow by the fact that cold water does not exercise the least influence in checking its progress. It may affect either the upper or lower jaw, or both, producing considerable general swelling of the parts. As a result of this the molar teeth of the upper and lower jaws may be pushed out of their natural position, so that they are no longer able

to serve their purpose of masticating the feed. It also happens that from degeneration of the tooth sockets the teeth drop out, this being indicated when the animal becomes unable to masticate its feed. Again, ulcerations frequently cause an opening to form on the external part of the tumor, and often a similar destructive process forms an opening into the mouth itself. In some cases, after growing for a short time, these swellings seem to become stationary, ceasing to grow. Such cases do not require treatment, as the arrest of the growth of the swelling generally is caused by the death of the parasite, which ceases to reproduce itself and becomes harmless. The living parasite, by rapidly reproducing itself, extends through the bony tissue, and by setting up inflammation causes a rapid increase of the swelling. The aim of treatment is to destroy the parasite, thereby arresting the growth of the swelling. Early treatment is of the utmost importance, in order to prevent the parasite from multiplying itself and destroying the tissues in which it is lodged.

Treatment.—When an external opening exists on the surface of the swelling it should be injected with Davis Lump Jaw Cure. If no opening exists several incisions should be made through the skin covering the swelling, and portions of the outer jaw bone should be removed with a trephine, and Davis Lump Jaw Cure injected into the orifices thus made. Apply this treatment daily, and continue it until it is apparent that the growth of the swelling has been checked. The remedy checks the growth of the swelling by destroying the parasite, and is the best remedy known. We do not give other treatment because we know of nothing to compare with Davis Lump Jaw Cure, and we know it does cure.

Inflammation of Mucous Membrane of Mouth, or Stomatitis, is caused by cattle eating some irritating substance, acid plants, for instance, causing inflammation of the membrane of the mouth. Again, little vesicles may form in the mouths of calves when they are affected with indigestion, constituting what is termed aphta.

Symptoms.—The saliva dribbles from the mouth, and when it is examined the surface of the tongue and other parts of the mouth will appear red and inflamed. In young animals affected with aphta, small red elevations will be observed on the tongue and other parts of the mouth, having little white points in the center. These white patches are succeeded by ulcerated surfaces which are exposed by the shedding of the white patches.

Treatment.—If merely a reddened and inflamed condition of the membrane of the mouth exists, it will suffice to syringe it out several times a day with 4 ounces of the following solution: Alum, 1 ounce; water, 2 pints; or, better still, Phenalin, 1 tablespoonful; water, 2 pints. If the edges of the tongue and other parts of the mouth are studded with ulcers these should be painted over once a day with the following solution until the affected surface is healed: Iodoform, 60 grains; ether, 1 ounce. When indigestion is associated with an ulcerated condition of the mouth that disorder must be treated separately.

Gangrenous Stomatitis

or gangrene of the mouth of young calves, usually appears in calves when they are cutting their molar teeth.

Causes.—Insufficient nourishment, the debility resulting from diarrhea and from inflammation of the navel, together with the already mentioned disorder of the digestive system, resulting from the cutting of the molar teeth, are the most usual causes of this affection. Older cows, however, are not exempt; it may arise in mature animals from causes which at present are unknown.

Symptoms.—In the early stages there is a redness of the mouth, from which the saliva dribbles, but in two or three days a whitish point appears on some part of the membrane of the mouth. It gradually extends in size and depth, and a red, inflamed zone surrounds the affected part, which gradually assumes a yellowish, cheesy appearance. As it begins to break up it decomposes, exhaling a disagreeable odor. Sometimes the entire thickness of a portion of the tissues composing the cheek becomes gangrenous. If the decayed part is not removed with a knife it is gradually separated from the surrounding living tissues by the process of ulceration. In this way an aperture is sometimes formed in the animal's cheek through which the saliva is ejected when it is masticating feed. The trouble may be complicated by diarrhea, which has an exhausting effect, as is shown by the animal's frequently lying down. The malady often terminates in death, and runs its course in from seven to ten days. In mature cows recovery does not, however, take place under three or four weeks; its duration varying according to the extent to which the animal is affected.

Treatment.—Sulphate of quinine should be given to calves three times a day in doses varying from 5 to 10 grains, according to the size and age of the animal, and should be repeated about four times a day. Half-ounce doses of lime water or Davis Scour Cure mixed with milk should be given if diarrhea is present. When the calf shows signs of debility, or diarrhea is present, whisky or brandy should be administered several times a day. Mix the stimulants with two or three parts of water, and repeat three or four times a day. In the cases of cows quinine should be given in dram doses. When the animal's appetite is poor or when it is weak, whisky or brandy should be given in half pint doses two or three times a day, mixed with two parts of water. To cleanse the mouth and remove the fetor it should be syringed out several times a day with the following solution: Phenalin, 1 ounce; water, 2 pints. When the gangrenous parts have sloughed, a lotion composed of sulphate of copper, 2 drams; water, 2 pints, or Davis Wire Cut Remedy should be applied every day to the raw surfaces to promote healing. The diet should be nutritious, and Davis Stock Food should be added to the ration, in the proportion of $\frac{1}{2}$ tablespoonful to each feed for calves, and 2 tablespoonfuls to each feed for mature cows. This will materially assist the digestion, cause the salivary juices to flow freely and healthily and insure a free circulation. The gangrenous tissue assumes a yellowish, cheesy appearance, and the animal's recovery will be hastened by removing dead tissue with a knife and not waiting until the process of ulceration separates it from the living parts. During the convalescent stage it is advisable to give carbonate of iron in combination with quinine. It may be given to calves in 10-grain doses, and to cows in 2-dram doses.

Actinomycosis of the Tongue,

or Induration of the Tongue, commences with small patches of a yellow color, which may appear on the upper or under surface, on the tip or on the sides of the tongue. The membrane covering these patches is thickened, and it soon breaks up into a number of pimple like excrescences which run together, and it then ulcerates and is cast off, leaving a red and excavated surface. These patches cover a number of nodular bodies, most of which are as large as a hemp seed, a few being as large as a cherry or walnut. When cut into they are seen to be composed of a yellowish, cheesy looking substance, which, when removed, leaves a sharply defined cavity or ulcer. Similar nodules may form on the inner surface of the cheeks, of the lips, on the surface of the palate, and even in some instances on the mucous membrane lining the nose.

Treatment.—When the nodules are large they may be dissected out or scraped out, so as to leave nothing but healthy tissue, and afterward dressed with Davis Lump Jaw Cure. When this is not possible an incision should be made into the nodule, which should then be injected with Davis Lump Jaw Cure. This treatment will destroy the fungus from which the nodules grow. To treat this disease successfully it should be attended to at the earliest possible time. After the muscular portion of the tongue has become enlarged and indurated it will not be possible to restore it to its healthy condition. Recently this disease has been treated with great success in Europe by the administration of iodide of potassium, given in doses of $1\frac{1}{2}$ drams dissolved in 1 pint of water, twice daily. It acts as a specific and is followed by rapid improvement and the permanent cure of the affected animal. Davis Lump Jaw Cure must be used locally, however. For antiseptic purposes, as a wash, Phenalin may be used to good advantage in the treatment of this disease. It is important to keep the digestion and circulation in perfect order, and to this end Davis Stock Food should be given the animal with its feed in the proportion of 2 tablespoonfuls to each feed for the grown animal.



DISEASES OF THE PHARYNX AND GULLET.

Pharyngitis, or Sore Throat, is an inflammation of the mucous membrane lining the pharynx. It is frequently associated with laryngitis and bronchitis, and sometimes with pleurisy.

Symptoms.—The muzzle is dry and the saliva dribbles from the corner of the mouth; the animal either does not swallow or swallows with difficulty; occasionally the liquids which it attempts to take come back in part through the nostrils, and the animal holds its neck stiff, in a straight position, moving it as little as possible. The eyelids are half closed, the white of the eye is bloodshot and the animal occasionally grinds its teeth. When it attempts to eat hay or grass, after masticating the feed the animal drops it out of its mouth as if to avoid the pain of swallowing, and also evinces pain when pressure is applied to the pharynx externally, trying to prevent such pressure being applied.

Causes.—A sudden cooling of the surface of the body, as when cattle are exposed to cold wind or cold rain.

Treatment.—The throat should be syringed three times a day with an ounce of a 1 per cent solution of Phenalin. Bland and soothing drinks, such as linseed tea, oatmeal and water should occasionally be administered. Diet should consist of soft feed, such as bran mashes, to which a little linseed meal has been added, and containing 2 tablespoonfuls of Davis Stock Food to each feed for the adult cow, and $\frac{1}{2}$ tablespoonful for calves. The upper part of the throat and the space between the jaws should be well rubbed once a day with Davis Veterinary Liniment, or if this is not at hand, make up a liniment of the following: Liquor ammonia fortior, 4 ounces; oil of turpentine, 4 ounces; olive oil, 4 ounces; mix. Under the above treatment the inflammation of the throat will gradually subside and the animal will be able to swallow usually in five or six days. Keep the animal in a comfortable stable during its sickness.

Parotitis. Inflammation of the parotid gland may arise from the inflammation extending to it when an ox is affected with pharyngitis or laryngitis; or the inflammation may commence in the salivary ducts and may depend on some influence the nature of which is unknown. Parotitis sometimes arises from a blow or contusion which is severe enough to set up inflammation in the structure of the gland.

Symptoms.—There is an elongated, painful swelling, commencing at the base of the ear and passing downward along the posterior margin of the lower jaw. It is generally limited to one side, and when extending to both sides is generally larger on one side than on the other. The secretion of saliva is increased, the appetite is poor, the neck is stiff so that it is painful to raise the head, and feed is swallowed with difficulty. Sometimes the swelling of those glands, when subjected to proper treatment, disappears in a comparatively short time, while in other cases the gland remains enlarged, even after the animal recovers its appetite.

Treatment.—Apply a warm bran poultice to the swollen gland, and whenever the poultice has cooled it should be replaced with a warm one. This treatment should be continued until an abscess forms, which may be ascertained by examining the surface of the gland with the fingers, and when on pressing any part of the surface it is found to fluctuate or give, we may conclude that an abscess has formed. Do not open the abscess before the fluctuation is well marked. Continue the poulticing for two or three days after the abscess has been opened. If an antiseptic is needed use Phenalin diluted in water; or, if this is not at hand, first sponge the wound with tepid water once a day, and then apply a little of the following lotion: Carbolic acid, 1 dram; water, 8 ounces. In some cases, after poulticing for four or five days, there will be no indication of softening at any point, the treatment may be discontinued; and then the swollen gland should be gently rubbed once a day with camphorated oil. If this fails to promote absorption or bring about a gradual dispersion of the swelling, to obtain this result,

the gland may be painted with tincture of iodine twice a day or rubbed once a day with a compound iodine ointment. When the swollen gland is not being poulticed it should be covered with a piece of flannel. The diet of the animal should consist of soft feed, and while under this treatment always add 2 tablespoonfuls of Davis Stock Food to each feed. In health the proportion should be 1 tablespoonful to each feed.

Pharyngeal Polypi. Tumors frequently form in the pharynx, and when they increase in size may give rise to a train of symptoms varying according to the situation which they occupy in that part. In almost any part of the pharynx, but especially near the entrance of the gullet, they will interfere with the act of swallowing; and this fact is so generally recognized in some parts of Germany that whenever an animal begins to lose condition it is said to have a growth of the throat.

Treatment.—The method of treatment in such cases is to separate the animal's jaws with an instrument termed a gag, and then after drawing the tongue partially forward to pass the hand into the pharynx, and to wrench or twist the tumor from its attachment. One veterinarian who has had considerable experience in the treating of this form of disease scrapes through the attachment of the tumor gradually with his thumb nail. In cases where the attachment is too strong to be severed in this way an instrument like a thimble, but possessing a sharp edge at the end, might be used to effect the same purpose. Give the animal 2 tablespoonfuls of Davis Stock Food to each feed while treating, in order to insure perfect digestion and circulation. As an antiseptic use Phenalin.

Choking is an accident usually happening from attempting to swallow too large an object, such as a turnip, potato, beet, apple or pear, though in rare cases it may occur from bran, chaff and the like.

Symptoms will vary somewhat according to the part of the gullet or throat in which the obstruction is located. Generally there is a discharge of saliva from the throat or mouth; the animal coughs frequently, and, when it drinks, the water is soon ejected. These symptoms, however, are not present in every instance.

Treatment.—Always put a gag in the animal's mouth, and, while the head is held in a horizontal position by two assistants, pass the hand into the pharynx and withdraw any foreign body lodged there gradually and steadily. If lodged in the upper part of the gullet pressure should be made by the assistant in an upward direction while the operator passes his hand into the pharynx; and if the operator cannot by pressure dislodge the substance from the gullet he may, by passing the middle finger above and partly behind the substance, gradually slide the object into the pharynx and then withdraw it through the mouth. The presence of an obstructing substance in the cervical portion of the gullet may be ascertained by passing the hand along the left side of the neck, where a hard and painless swelling will be found to indicate the presence of the foreign body. In such cases you must endeavor, by gentle and persevering pressure with the thumb and the two next fingers, to slide the obstruction gradually upward to the pharynx. To help this process along give the animal a wineglassful of olive oil before commencing the manipulation. After the substance has been brought forward to the pharynx the mouth-gag should be used and the method already described employed. When bran or chaff causes the trouble it is well to give a small quantity of oil to lubricate the walls of the gullet and then, by gentle, persevering pressure, endeavor to separate and divide the mass, working it down toward the stomach. To assist this, pour small quantities of oil and water down the animal's throat between whiles. Do not use the probang to push down any soft substance as it tends to condense and make the obstruction firmer, so that in the end it forms a solid, resisting mass which cannot be moved.

In some cases the substance cannot be dislodged from the neck by pressing and manipulating that part externally. In this case we must resort to the probang; or, if the foreign body is lodged in that part of the gullet which passes through the thorax or chest, there is no way of removing it except by the probang. It is best to have a veterinarian show you the use of this instrument before you attempt to employ it yourself. In case the substance is lodged in the part of the gullet commonly called the neck, and if it be soft and easily broken a blow on it from the outside may alter its shape or crush it, admitting of its passing down; but if it be a hard substance this method is dangerous and must not be resorted to. If the above methods fail, call in a veterinarian.

Wounds and Injuries of the Gullet.

Often from the too rash and forcible use of the probang the walls of the gullet are more or less lacerated, and pain and difficulty attend the swallowing. In such cases dry feed must be withheld for five or six days, so as to allow the injured part to heal, and the diet must be limited to linseed tea, hay tea, thin oatmeal gruel, etc., always adding 2 tablespoonfuls of Davis Stock Food to each feed, as a tonic and to strengthen the system. If an operation by a veterinarian was necessary, cutting into the gullet to remove the foreign body, the same diet should be employed. In a few instances the gullet may be lacerated and ruptured so much that treatment of any kind is hopeless. If this be the case, better slaughter the animal without delay. In emergency the handle of a whip, or any similar flexible substance, may be used in place of a probang.

DISEASES OF THE STOMACH.

Tympanites, Hoven, or Bloating

is a disease characterized by swelling of the left flank, and is caused by the fermentation of gas in the rumen or paunch.

Causes.—Feed which produces indigestion. When cattle are first turned into young clover they eat so greedily of it that tympanites frequently results. Turnips, potatoes and cabbage may also cause it; middlings and corn meal frequently give rise to it. An excessive quantity of these feeds may produce it, or it may be due not to excess but to eating too hastily. The quality of the feed may be at fault. Grass or clover, when wet by dew or rain, frequently disorders digestion and brings on tympanites. Frozen roots or pastures covered with hoar frost should also be regarded as dangerous. When feed has been eaten too hastily, or when it is cold or wet, the digestive process is imperfectly performed and the feed contained in the paunch ferments, during which process large quantities of gas is formed. This may also be the case when a cow is choked, as the obstruction in the gullet prevents the eructation or passing up of gas from the stomach, so that the gas continues to accumulate and tympanites results.

Symptoms.—Swelling of the left flank. In well marked cases the flank at its upper part rises above the level of the backbone and when struck with the tips of the fingers emits a drum like sound. The animal has an anxious expression, moves uneasily, and is evidently distressed. If relief is not obtained in time it breathes with difficulty, reels in walking or standing, and in a short time falls down and dies from suffocation. The distention of the stomach may become so great as to prevent the animal from breathing, and in some instances the case may be complicated by rupture of the stomach.

Treatment.—In urgent cases use the trocar at once. The trocar is a sharp pointed instrument encased in a sheath, which leaves the sharp point of the trocar free. In selecting the point for using the trocar, a spot equally distant from the last rib, the hip bone and the transverse processes of the lumbar vertebra must be chosen. Make an incision of about $\frac{3}{4}$ of an inch through the skin, then direct the sharp point of the trocar downward, inward, and slightly forward, thrusting it into the paunch. The sheath of the trocar should be left in the paunch so long as any gas continues to issue therefrom. Otherwise it may be necessary to insert it again. Hence, be careful not to remove it before all gas formed or forming has escaped. To be certain on this point place the palm of your hand about two inches above the mouth of the canula, when, if gas is issuing, the sensation produced by the current of gas coming in contact with the skin will enable you to form an accurate opinion. Occasionally it is necessary to keep the canula in the stomach for several hours. In such cases a piece of stout cord should be passed around the neck of the canula immediately below the projecting rim, and then passed around the animal's body and tied in a secure knot. The rim surrounding the mouth of the canula should be in contact with the skin. When the canula is secured as described it may be left in position over night. It has even been found necessary to leave it for two days. However, whenever you are satisfied that gas has ceased to issue from the canula, remove it. Only use the canula in extreme or urgent cases, and we only advise its use by a veterinarian. If the animal is not distressed, and the swelling of the flank not great, use internal medicines. Give a double dose of Davis Colic Cure and repeat in three hours; or, if this is not at hand, give 2 ounces of aromatic spirits of ammonia every half hour in 1 quart of cold water; or $\frac{1}{2}$ ounce

of chloride of lime may be dissolved in 1 pint of tepid water, and the dose repeated every half hour until the bloating has subsided. It is generally necessary to give a dose of purgative medicine after bloating has subsided, as animals frequently show signs of constipation after attacks of indigestion. Davis Stock Food, 2 tablespoonfuls to each feed, will prove of the utmost value, as it perfects the digestion and circulation. After treatment, and after the recovery of the animal, you may continue to use it, reducing to 1 tablespoonful to each feed, thereby keeping your cow in good health and vitality, and practically insuring it against disease. When the bloating is not too great, gentle walking exercise will facilitate the removal of gas.

Chronic Tympanites.

Cattle, especially such as have been kept in stable all winter, are liable to suffer from chronic tympanites, causing the animal to bloat up after feeding, although the swelling rarely is so great as to cause any alarm. The chronic form of the disease may also follow an acute attack like that previously described.

Treatment should be preceded by a moderate dose of purgative medicine, also using Davis Stock Food, 2 tablespoonfuls to each feed, to aid the digestion and assimilation. If this does not cure the disease, as it will in milder cases, try the following: One pound of sulphate of magnesia, $\frac{1}{2}$ ounce of powdered Barbadoes aloes, 1 ounce of powdered ginger, 1 pint of molasses. Stir the powder for a few minutes with 2 quarts of luke warm water, then add the molasses, stir the whole together for ten minutes, then administer. After the operation of the purgative give some good tonic and antacid preparation such as Davis Stock Food. Let the animal go out once a day, as want of exercise favors this form of indigestion. Cases sometimes occur that resist treatment, and may be due to some organic malformation, such as an enlarged lymphatic gland pressing on the gullet, etc.

Distention of Rumen or Paunch with Food

is a form of indigestion caused by the animal gorging itself with feed. There is comparatively little formation of gas, and the gas which is formed is diffused through the stomach instead of accumulating in a layer in its upper part. On pressing the flank with the closed fist the indent of the hand remains for a short time in the flank, as if the rumen were filled with a soft doughy mass. This form of indigestion should be treated with stimulants, such as have been prescribed in speaking of the two preceding diseases. If Davis Stock Food is used, 1 tablespoonful to each feed in health, and 2 tablespoonfuls to each feed in disease, the trouble as a rule can be prevented. If, however, the disease has been contracted, and the treatment recommended fails to bring relief, the impacted or overloaded condition of the rumen continuing, a veterinarian should be called and an incision should be made with a sharp, long bladed knife in the left flank, commencing at the point where it is usual to puncture an ox, and prolonging the incision in a downward direction until it is long enough to admit a hand. When the point of the knife is thrust into the flank and the blade of the knife cuts downward, the wall of the stomach, the muscle and the skin should all be cut through at the same time. Two assistants should hold the edge of the wound together, so as to prevent any feed from slipping between the flank and the wall of the stomach, and then the operator should remove two thirds of the contents of the rumen. This having been done the edges of the wound should be sponged with a little warm water and Phenalin, and, the lips of the wound in the rumen being turned inward, they should be brought together with catgut stitches. The wound penetrating the muscle and the skin may then be brought together with silk stitches, which should pass through the entire thickness of the muscle and should be about an inch apart. The wound should afterward be dressed once a day with a lotion and the animal covered with a tight linen sheet to protect the wound from insects and dirt. The lotion used may be made up either of Phenalin, in a 2 per cent solution, or, if this is not at hand, sulphate of zinc, 1 dram; carbolic acid, 2 drams; glycerine, 2 ounces; water, 14 ounces; mix.

Loss of Cud

means that the animal does not ruminate or chew its cud. It is a symptom of suspended rumination, and shows that the animal's digestive functions are not performed as regularly as usual. It is a symptom of a great many diseases, and, when its existence is detected, it should lead the observer to try to discover other symptoms, so that he may be able to gain a correct opinion as to the nature of the disease from which the animal suffers.

Vomiting

should not be confounded with rumination, though it has been asserted that it is merely a disordered and irregular rumination. It is not very common in cattle.

Symptoms.—Animals which vomit are frequently in poor condition. After eating peacefully for some time the animal suddenly becomes uneasy, arches the back, stretches the neck and head and then suddenly ejects nineteen or twenty pounds of the contents of the rumen. Then the uneasiness subsides, and in a short time it resumes eating as if nothing had happened.

Causes.—The causes of a disordered condition of the digestive system in cattle is rather obscure. The vomited matter proceeds from the rumen, showing temporary nervous disorder of the part. Cancerous disease of the fourth stomach has been found to be the cause in some cases.

Treatment.—Easily digested feed, to which is added Davis Stock Food, 2 tablespoonfuls to each feed, and plenty of water should be given. Fear and excitement, chasing or hurrying of the animals after eating is apt to bring on this result. Hydrate of chloral, $\frac{1}{2}$ ounce; whisky, 8 ounces; water, 1 pint, may be used to remove the conditions which produce vomiting. Repeat the dose when the condition of the animal seems to require it.

Depraved Appetite,

or Pica, is indicated in cattle by capricious and variable appetite as regards their ordinary feed, while they evince a strong desire to lick and eat substances for which healthy cattle show no inclination. Cows in calf and young cattle are especially liable to develop these symptoms. Animals affected in this way lose condition, their coat becomes staring, gait slow, and small vesicles containing yellow liquid form under the tongue. The milk given by the cows is thin and watery. The animals become restless and uneasy and bellow frequently. The disease may last for months, the animal ultimately dying—worn out with fever. Depraved appetite frequently precedes the condition in which the bones of cattle become brittle and fracture easily, and which is known by the name of osteomalacia.

Causes.—Bad feed, especially feed which has undergone changes which lessen its digestibility and impair its nutritive value. Cattle pastured on low, swampy lands seem predisposed thereto. The assimilation is imperfect. There is a lack of the constituents required to supply the wear and growth of the body.

Treatment.—In a case like this Davis Stock Food, 2 tablespoonfuls to each feed, will be of the greatest possible benefit, and if used as directed will positively effect a cure. It increases the action of the salivary glands, insuring perfect work of the digestive organs, this again reacting upon the circulation throughout the entire system and making the animal assimilate every morsel of the feed that passes through its belly. If Davis Stock Food is used regularly, 2 tablespoonfuls in disease and 1 in health, other remedial agents or correctives are unnecessary; but should the affection already exist, and the stock food is not on hand, the following treatment should be given: Carbonate of iron, 6 ounces; powdered gentian, 6 ounces; common salt, 4 ounces; powdered fenugreek, 10 ounces; mix. In addition to this 3 tablespoonfuls of charcoal (if Davis Stock Food is not given) should be mixed with the animal's feed at least three times a day, and a piece of rock salt should be placed where the animal can lick it.

Hair Concretions,

or hair balls, are produced by animals licking themselves, or licking other animals. The hairs swallowed are carried around by the contractions of the stomach and gradually assume the form of small pellets or balls. These increase in size as fresh quantities of hair are introduced into the stomach, becoming adherent to the surface of the hair ball.

There are no certain symptoms by which we can determine the presence of hair balls in the stomach, and therefore no treatment can be recommended. Keep the digestion and circulation of your cattle in perfect working order, by the regular use of Davis Stock Food, and the danger from this source will be a remote one.

Indigestion of the Third Stomach,

popularly known as grass staggers, dry murrain, wood evil, is a disease concerning the exact nature of which authorities disagree. There is, however, a general agreement that the seat of the disease is in the third stomach. Perhaps it is more correct to regard it as a general disorder of the digestive organs.

Causes.—Want of exercise; coarse, indigestible feed; feed containing astringent properties and tending to check secretions; an excessive quantity of feed. It often appears toward the end of a prolonged season of drought; a deficiency in water may therefore be one of the causes. The causes, however, are not sharply defined.

Symptoms.—Diminished appetite, rumination irregular, tongue coated, mouth slimy, dung passed apparently not well digested and smelling badly, are some of the more prominent symptoms.

Treatment.—Keep the digestion and assimilation of your animals up to the standard by using Davis Stock Food in the proportion heretofore indicated (1 tablespoonful to each feed in health and 2 tablespoonfuls to each feed in disease for adult cows; calves, $\frac{1}{2}$ tablespoonful in health and disease), and you will have but little trouble from this source. The diet should be rather laxative and of a digestible character after an attack. If the disease has had time to develop, aromatic and demulcent drafts should be given to produce a soothing effect on the mucous lining of the stomach. Boil 2 ounces of camomile flowers for twenty minutes in a quart of water, and, on cooling, give the infusion to the affected animal. Repeat three times a day. If constipation is present administer the following purgative: Sulphate of magnesia, 1 pound; Barbadoes aloes, $\frac{1}{2}$ ounce; powdered ginger, 1 ounce; powdered nux vomica, 1 dram; fluid extract of belladonna, $\frac{1}{2}$ ounce. Stir up the different powders contained in this prescription in 2 quarts of luke warm water, add the fluid extract of belladonna and then administer the dose. After this purgative has acted, if there is a lack of appetite and the animal does not ruminate regularly, the powder mentioned in remarks on the treatment of chronic tympanites should be given according to directions. As stated, Davis Stock Food used as a preventive is preferable at all times, and when the disease is present its faithful use will make most of the other measures unnecessary.

Indigestion from Drinking Cold Water,

or colic, is a disorder produced by drinking copiously of cold water, which arrests digestion and produces cramp of the fourth stomach, probably of the other stomachs and also of the bowels. It is frequently observed in working oxen during hot weather.

Causes.—During hot weather when the ox has been working, and consequently is very thirsty, he is apt, contrary to his usual habits, to drink a large quantity of cold water, and is often immediately after taken with a severe case of colic. Milch cows also may be affected in the same way in winter, when they are let out of a warm stable to be watered. Cows which are fed largely on dry hay drink copiously, like the working ox, and become affected in precisely the same manner. The secretion of milk in a cow is usually much diminished after such attacks.

Symptoms.—Distention of the abdomen, but no accumulation of gas. This distention and pain occur immediately after the animal has drunk the water, and there can therefore be no doubt as to the cause of the disease.

Treatment.—French farmers are said to walk or even trot the ox up and down, and as a result of this treatment the water passes from the fourth stomach into the bowels, from which it is soon passed off. Diarrhea then appears to be a favorable termination of the disease. This treatment should be adopted in a modified form. It is plainly dangerous to trot the animal whose bowels are largely distended with water, but it appears rational to walk the animal about ten minutes before administering medicine, as this allows time for a portion of the contents of the stomach to pass into the bowels, and renders it safer to give the medicine. In many cases the walking exercise and the diarrhea bring about a cure. If not, give 1 bottle of Davis Colic Cure; or, if this is not on hand, 1 ounce of sulphuric ether and 1 ounce of tincture of opium shaken up with 1 pint of warm water, repeating the dose in half an hour if the animal is not relieved. One cupful of Davis Stock Food will usually effect a cure. In an emergency, when medicine is not to be had, $\frac{1}{2}$ pint of whisky may be substituted, and should be given mixed with 1 pint of warm water; or 1 tablespoonful of powdered ginger may be administered in the same way as the remedies already mentioned. These cases very rarely terminate fatally.

also called gastric catarrh, diarrhea or white scour, is a form of diarrhea common to suckling calves.

Indigestion in Calves,

Causes.—Calves sucking their dams are not infrequently subject to this disease, though it may be occasioned by their sucking at too long an interval and thus overloading the stomach and bringing on indigestion. Calves fed on artificial feed, used as a substitute for milk, also frequently contract it.

Symptoms.—The milk passing into the fourth stomach becomes curdled and acts as an irritant on the surface of the stomach and bowels, so that a catarrhal condition of the mucous membrane results. The passages have a thin, yellowish white appearance and become very frequent. The calf becomes dull, whisks its tail as if in pain whenever there is a passage from the bowels, loses its appetite, becomes weak, and unless the disease is checked in time it dies in a few days from exhaustion.

Treatment.—Give the calf from 1 to 2 ounces of castor oil and 1 tablespoonful of laudanum. A mild dose of purgative medicine should be given to remove the curdled milk from the stomach and bowels. These remedies, however, may be dispensed with if Davis Scour Cure is used in accordance with the directions given. For scour and allied diseases in calves there is no better, swifter or safer remedy in the world than this. To allay irritation we recommend the following, divided into twelve powders: Powdered rhubarb, 1½ ounces; carbonate of magnesia, 3 ounces. Shake up with 1 wineglassful of new milk, to which 2 tablespoonfuls of whisky should be added. A little fresh milk should be given about six times a day, or the calf allowed to suck about six times a day, but the quantity should be limited. Always examine the mother as to her condition of health, diet, etc., as the disorder may sometimes be traced to some disease or mismanagement affecting the mother. Give the mother 1 tablespoonful of Davis Stock Food to each feed to keep her in healthy normal condition.

Gastro Enteritis consists of an inflammation of the mucous membrane of the fourth stomach and bowel. It is seldom limited to the mucous membrane of the fourth stomach, but almost always involves the mucous membrane of the bowel to a greater or lesser extent.

Causes.—Long intervals between times of feeding; sudden checking of perspiration; putting working oxen to severe work immediately after feeding, so that they do not have time to ruminate; sudden changes of diet. (Rest your oxen after feeding, so that ruminating is not interfered with. Do not feed stale grass.)

Symptoms.—Dullness; drooping of ears; dryness of muzzle; dry skin; staring coat; loins morbidly sensitive to pressure; fullness of the left flank, which is owing to the distention of the fourth stomach by gas. The pulse is small; the gait is feeble and staggering, each step the animal takes is accompanied by a grunt, and this symptom is especially marked if the animal is walking in a downward direction; there is loss of appetite and the rumination is suspended. On the second day of sickness the passages are few in number, hard, and are sometimes coated with mucus. At the last stage of the disease the passages exhale a putrid odor which may even occasion sickness in other animals. Therefore, if possible, keep the sick animals apart from the healthy ones. When the sick animal assumes a recumbent position there is a continual grunt or moan which appears to accompany each expiration; if the case is allowed to go on the animal usually dies in convulsions, and in some cases at this time a bloody liquid issues from the mouth and anus.

Treatment.—Bradbury's Brazilian Specific, used in accordance with directions, is one of the best and safest treatments known to science for this malady, and the prudent farmer will do well in always having a supply of it at hand for emergency. Owing to the fact that this malady is frequently caused by imperfectly digested feed, setting up inflammation of the mucous membrane of the bowels, it is also advisable when disease is supposed to originate from such cause to give 1 pint of castor oil before starting the use of the specific. If Bradbury's Brazilian Specific is not at hand, give the following three times a day: One quart of linseed tea in which 1 ounce of carbonate of magnesia has been dissolved, and along with each dose 10 drops of tincture of aconite should be combined. Let the feed be soft and easily digested, adding to each feed 2 tablespoonfuls of Davis Stock Food for adult cattle. It is also advisable as early as the second day of the animal's sickness to give small quantities of hay or grass so as to encourage the animal to ruminate, which it will not do if kept entirely on soft and liquid feed. Do not give too much, however. Purgative remedies should only be administered when absolutely necessary.

Diarrhea results either from increased action of the muscular coat of the intestines, an unusually liquid state of their contents, or, generally, from both of these conditions combined.

Causes.—Irritation of the intestines, by taking feed in excess or of improper quality, especially soft, watery, green feed; excessive secretions, especially bile; impure water and water drunk in excess;

mechanical congestion of the intestinal vessels; acute or chronic inflammation of the bowels. It also may be a symptom attendant upon some other disease. Exposure to changes of temperature, either excessive heat or cold, may produce it.

Symptoms.—The animal is dull, places its feet well under the body, arches its back, and shows thirst. Passages from the bowels are frequent, at first consisting in thin dung, but later becoming watery and offensive smelling, and may even be streaked with blood. Often it is accompanied with fever, great depression, loss of strength, rapid loss of flesh, and it may terminate in death.

Treatment.—Davis Scour Cure is a specific for diarrhea and kindred diseases, composed of the best counteracting and correcting remedial agents known to science, and if given according to directions it will cure all ordinary cases. Two tablespoonfuls at a dose should be given to full grown cattle. When the disease is caused by irritating properties of the feed, it is advisable to give a mild purgative, such as 1 pint of castor oil or linseed oil. If Davis Scour Cure is not at hand, give, in cases where the secretions of the bowels are irritating, 1 ounce of carbonate of magnesia and $\frac{1}{2}$ ounce of tincture of opium, shaken up in 1 quart of linseed tea. Give three times a day until the passages present a natural appearance. When there is debility, want of appetite, no fever but a continuance of the watery discharges from the bowels, an astringent may be used. Try powdered galls, 6 ounces; powdered gentian, 2 ounces. Mix and divide into twelve powders. Give one powder three times a day until the passages present a natural appearance. Mix each powder with $\frac{1}{2}$ pint of whisky and 1 pint of water. If Davis Scour Cure is used the other remedies may, as a rule, be dispensed with. Davis Stock Food, 2 tablespoonfuls to each feed, should be given throughout the treatment to correct the digestive and assimilative functions.

Dysentery

begins with an inflammation of the membrane of the colon, though the disease may extend to the caecum and rectum. It is popularly known in the country as bloody flux and red murrain.

Causes.—Feeding cattle on hay which has been made during a wet season, musty oats, or any forage which is largely infested with parasitic growths. Hay or coarse oats containing a large proportion of woody fiber, pastures which have been inundated, and the vegetation growing in low, marshy localities, etc., may set up irritation of the membrane, terminating in dysentery. Water containing a large percentage of organic matter may also be the cause. The passages of animals suffering from this malady should be regarded as infective, and should be disinfected, buried or burned.

Symptoms.—Animal eats slowly, ruminates less frequently than when in health, and walks slowly. Colicky pains are sometimes indicated. In advanced stages the animal ceases to ruminate and eat, the muzzle is dry, the eyes sunken, the coat rough, the skin dry, adherent and hidebound. Bowels act irregularly, and the passages are thin, black colored, grayish; passage then becomes fetid, more frequent, and streaked with blood. The disease does not run a rapid course, and when it proves fatal the membrane of the bowels will be found to be thickened and reddened at some parts, showing ulceration at other points, and covered with layers of mucus on some portions of its surface.

Treatment.—Here, as in all diseases of this nature, Davis Scour Cure will be found the remedy par excellence, and in all ordinary cases it will bring about a cure in the shortest possible time. Always have it on hand, and at the first indication of the disease start to give mature cattle 2 tablespoonfuls at a dose, and young stock in accordance with the directions, and it will be the means of saving you many and many a cow. If you do not have it on hand, try the following: When the first symptoms of dysentery are observed mix 1 pound of sulphate of magnesia with 4 quarts of tepid water, then add 2 drams of dilute sulphuric acid gradually. Give this in one dose, and administer as early in the disease as possible. Let the feed be soft and easily digested, consisting of grass, boiled or pulped roots. Always add 2 tablespoonfuls of Davis Stock Food to each feed. (The regular proportion is, as has heretofore been stated, 2 tablespoonfuls to the grown cow or ox in disease, and 1 tablespoonful in health, as a preventive and strengthener; calves should be given half the amount.) If Davis Stock Food is not at hand give nutritive drinks, such as linseed tea, hay tea, etc. When the purgative heretofore mentioned has unloaded the stomach to some extent, give the following powder three times a day, mixed with a quart of linseed tea: Powdered ipecacuanha, $1\frac{1}{2}$ ounces; powdered opium, $\frac{1}{2}$ ounce; mix and divide into twelve powders. If this is not effective, try oil of turpentine, given in

$\frac{1}{2}$ ounce doses three times a day in 1 quart of sweet milk. If Davis Scour Cure is given according to directions, and Davis Stock Food included with the feed ration, these remedies may be dispensed with.

Simple Enteritis

is an inflammation involving the mucous, muscular, and serous coats of the bowels.

Causes.—It occurs at all seasons of the year, but most frequently where there are great variations of temperature. In oxen hard work may be the cause. Eating such feed as musty hay and oats, forage containing acid plants, leaves of trees infested with caterpillars, grass which has commenced to ferment after cutting, dusty hay, and grass covered with hoar frost may give rise to enteritis. Copious drinking of cold water may produce it. Exposure to cold, damp wind, or any influence which suddenly chills the surface of the body, may operate as a cause.

Symptoms.—Dryness of the muzzle, diminished appetite, partial or total cessation of rumination, symptoms of colic which are indicated by restlessness. The animal lies down and gets up frequently, looks around at its flank, raises its tail, paws with the front feet, and strikes with its feet at the abdomen. After a time the signs of acute pain subside, and the animal lies down, but does not appear to be free from pain, turns its nose toward the flank and does not eat or ruminate. When injections are given they are soon ejected from the bowels; the passages are dry, glistening, and coated with mucus. Gas is frequently passed; frequent attempts at urination are made but only a small quantity passed at a time. The disease comes on suddenly and runs a rapid course, death in fatal cases taking place in four or five hours. If taken in time recovery may take place in a short time. By using Davis Stock Food regularly the disease, as a rule, can be prevented.

Treatment.—Bradbury's Brazilian Specific; have it at hand and use it as early as possible, soon as the first symptoms of the disease show. If the disease has gained headway bleed the animal to the extent of from 2 to 4 quarts, taking into consideration the age and condition of the animal. Then give $\frac{1}{2}$ -ounce doses of laudanum several times a day, mixed with linseed tea. During the disease increase the quantity of Davis Stock Food to 2 tablespoonfuls.

Hemorrhagic Enteritis

is a rare disease but comes on suddenly, and is characterized by a hemorrhage or exudation of blood between the mucous and muscular coats of the bowels.

Malady usually occurs among working oxen during very hot weather. It is more dangerous than the form already described. After the acute symptoms subside the animal may show great weakness, owing to the hemorrhage. Do not bleed. Tone and strengthen by the use of Davis Stock Food. Give Davis Scour Cure according to directions.

Mercurial Enteritis

is an inflammation of the bowels, which may be produced by cattle licking off the mercurial ointment rubbed on them in skin diseases.

Symptoms are similar to those occurring in the forms of enteritis already described. Special symptoms are grinding of the teeth and dribbling of saliva from the corners of the mouth. Two or three days after the attack gas is frequently passed from the bowels; the belly is tucked up and the flanks become hollow; the passages are very thin and coated with mucus. On the fifth or sixth day there is a swelling of the tongue and mucous membrane of the mouth, quivering of the muscles of the limbs, staggering gait, great emaciation. The animal dies about the twelfth day.

Treatment.—Do not use mercurial ointment in the treatment of skin diseases. If it has been done, and you have Bradbury's Brazilian Specific at hand use it according to directions as soon as the first symptoms appear. In the last stages there is no hope of recovery. Give drafts composed of the whites of eggs and sweet milk (purgatives) followed by the administration of chlorate of potash. The eggs and sweet milk should be given immediately after it is known that the animal has swallowed the mercurial ointment, each quart of milk mixed with the whites of two eggs. Give a quart of the mixture three or four times a day at short intervals, say half an hour, then give a pint of castor oil. After the castor oil has taken effect, give $\frac{1}{2}$ ounce of chlorate of potash, dissolved in 1 quart of warm water, three times a day. For debility and want of appetite, resulting from such illness, give Davis Stock Food, 2 tablespoonfuls to each feed, as usual. If this is not at hand, $\frac{1}{2}$ dram of nux vomica combined with 2 drams of powdered gentian should be given three times a day.

Enteritis. Resulting from invagination or intussusception, twisting and knotting of the bowels. A knot forming on some part of the small intestines may cause inflammation; inflammation may also arise from a portion of the bowel becoming twisted on itself, or from one part of the bowel slipping into another, which is termed invagination. This form of enteritis occurs occasionally in animals of the bovine species.

Causes.—The small intestine, which in the ox rests on the right sac or division of the rumen, is from the position which it occupies predestined to this accident. It has been ascertained that animals which have shown symptoms of this malady have trotted, galloped, or otherwise made violent exertions in coming from drinking; or that they have been chased by dogs or by animals of their own species while at pasture. The danger of jumping or running seems to be very slight to the ox if he is fasting, as the rumen in that case not being distended with feed allows the small intestine to fall to the lower part of the abdomen; but when the rumen is distended the bowel does not slip so easily to this position.

Symptoms.—Severe colicky pains; the ox scrapes and strikes the ground with his front and hind feet alternately; lies down and gets up again; keeps his tail constantly raised, and turns his nose frequently to his right flank; is frequently bloated and tympanitic on that side; refuses feed; does not ruminate, and for some hours suffers severe pain. At first thin dung is passed, with frequent urinating, in small quantities. On the second day the pains have become less acute; the animal remains lying down; moans occasionally; his pulse is small and quick; he refuses feed and does not ruminate. At this stage he does not pass any dung, though sometimes a small quantity of bloody mucus may be passed. Cattle so affected may live for fifteen or even twenty days.

Treatment.—Save your cattle from becoming victims of this disease by always having Davis Stock Food at hand and keeping the digestive and assimilative powers in healthy condition. This in nine out of ten cases will prevent the attack. Once the animal is affected, treatment of any kind is of little or no avail.

Constipation is rather to be regarded as a symptom of disease than as a disease itself. In order to remove it the treatment must be applied to remove the causes which give rise to it. Calves may suffer from constipation immediately after birth, and the meconium feces that accumulate in the bowels before birth is not passed, as is usually the case in calves. The cause seems to be that the dams of such calves have been fed too exclusively on dry feed before the calf's birth. To prevent this, vary the diet of the mother before birth and add 1 tablespoonful of Davis Stock Food to each feed. If the calf is constipated give 1 ounce of castor oil shaken up with 1 ounce of new milk. The mother's milk is the best to prevent recurrence of the constipation.

Intestinal Worms. Cattle are less infested with intestinal parasites than any other species of our domestic animals. An examination of the passages is the only certain method of determining the existence of worms.

Treatment.—Goodard's Worm Powders is the best known remedy for all kinds of worms and parasites in the bowels of cattle. They are included among the Davis remedies, and if used according to directions they rarely fail to bring about a cure. If they are not at hand, try the following: To remove tapeworms give 1 ounce of male fern three times a day in 1 pint of milk for three days in succession, and then on the fourth day give 1 pint of castor oil. For round worms give 2 drams of sulphate of iron three times a day, mixed in a little oats and middlings, and after continuing treatment for three days give 1 pint of castor oil, as before described. In treating calves, which are more apt to be infested with worms than grown cattle, reduce the doses to one-fourth or one-third. Davis Stock Food regularly fed with the ration will as a rule prevent worms occurring in cattle, keeping the digestion and the alimentary canal in perfect condition.

RUPTURES.

Hernia of the Bowels.

Hernia of the bowels, which are situated on the upper or right side of the abdomen, are usually formed by the small intestines. In an intestinal hernia the swelling is usually not painful, of a doughy consistency or elastic, according as the intestine does or does not contain alimentary matter. This swelling can generally be made to disappear by pressure, and when it has been reduced one can easily recognize the direction and extent of the hernial opening. In hernia of the small intestine adhesion of the protruding parts of the walls of the opening, or strangulation, are complications which sometimes take place. If adhesion has taken place the swelling cannot be reduced by pressure, and when strangulation has occurred the animal shows signs of pain. In such a case the edges of the opening through which the bowel has passed press on the bowel so as first to excite pain, then inflammation, which, if unrelieved, usually terminates in gangrene. The animal is restless, turns its nose to the painful part and shows those symptoms which are usually collectively indicated under the term colic. When the swelling of hernia contains a portion of peritoneum it is soft and doughy and does not produce the sensation on handling it that it does when containing gas or alimentary matter.

Hernia of the Fourth Stomach

usually occurs in calves; often caused by a blow from a cow's horn on the right flank of the calf; and this may happen when the calf is trying to suck a strange cow. After such an accident a swelling forms on the right flank near the last rib. It may be either hot or painful, even at first, but is soft to the touch.

It can be made to disappear by careful pressure when the sides of the aperture through which it has passed can be felt. Try this application of pressure to remove the hernia immediately after the occurrence, when the edema which accompanies the swelling has disappeared.

Treatment.—If a hernia is reducible, that is, can be pushed back into the abdomen, it is advisable to maintain it in its natural position, and to allow the walls of the laceration to adhere or grow together. Here are some directions given by an eminent French veterinarian for the treatment of this form of hernia:

First prepare a bandage (must be of strong material) about 10 yards long and between 3 and 4 inches broad, and a flexible and solid piece of pasteboard, adapted in size to the surface of the hernia. Then replace the protruding organ in the abdomen and maintain it in that position during the application of the bandage. This being done, a layer of melted pitch and turpentine is quickly spread on the skin covering the seat of the hernia, so as to extend somewhat beyond that space. This adhesive layer is then covered with a layer of fine tow, then a new layer of pitch and turpentine is spread on the tow, and the piece of pasteboard is applied on the layer of pitch, its outer surface being covered with the same preparation. Lastly the bandage, adhering to the piece of pasteboard and to the skin, is carefully applied so as to form an immovable, rigid and solid bandage, which will retain the hernia long enough for the wound in the abdominal walls to heal permanently. While treating this condition it is important to keep the digestion perfect and passage of feed through the alimentary canal unobstructed. To this end feed Davis Stock Food regularly with the ration.

Umbilical Hernia,

or hernia of the navel, is very common in very young animals. The umbilicus, or navel, is the aperture through which the blood vessels pass from the mother to the fetus and, naturally, the sides of this aperture ought to adhere or unite after birth. In new born calves and other very young animals this aperture in the abdominal muscles remains open and a part of the bowel or a portion of the mesentery may slip through the opening, constituting what is called umbilical hernia. The wall of the sac is formed by the skin which is covered on the inner surface by a layer of cellular tissue, and within this there is sometimes, but not always, a layer of peritoneum.

Causes.—In the new born animal the opening of the navel is generally too large, and this opening may sometimes give way to the pressure of the bowel on account of the weak and relaxed condition of the abdominal muscles. This defective and abnormal condition of the navel is frequently hereditary. Roughly

pulling away the umbilical cord may occasion it; also kicks or blows on the belly; severe straining, by which the sides of the navel are stretched apart. It is best in new born calves to tie the umbilical cord tightly about 2 inches from the navel and then leave it alone, when it will drop off in a few days in most cases, leaving the navel in a closed condition.

Treatment—Small hernia of this nature will, as a rule, heal of themselves. However, in cases where there are no indications that a spontaneous cure will take place, the calf should be laid on its back, and immediately on this being done the hernia will often disappear into the abdomen. If it does not its reduction may be brought about by gentle handling, endeavoring, if need be, to empty the organs forming the hernia before returning them into the abdomen. After returning the hernia, clip the hair from the skin covering it, and apply a compress composed of ten or twelve folds of linen or cotton, first smearing the skin with pitch, and then a bandage about 3 inches wide should be passed around the body so as to retain the compress in position. The lower part of the compress should be smeared with pitch, and also those parts of the bandage which pass over it, so as to keep it solid and prevent it from shifting. In some cases it will be found that the contents of the sac cannot be returned into the abdomen and this generally arises from the fact that some parts of the contents of the sac have grown to or become adherent to the edges of the umbilical opening. In such cases a veterinarian should be called, and the skin must be carefully laid open in the long direction, the adhesions of the protruding organs carefully separated from the umbilicus, and after the protruding parts have been returned into the abdomen, the sides of the umbilicus must be freshened if necessary by paring, and then the edges of the opening brought together by catgut stitches; the wound in the skin must then also be carefully dressed every day and a bandage passed around the body so as to cover and protect the part operated on.

In small hernia nitric acid has been used successfully in the same manner as has been described in speaking of the treatment of ventral hernia. Sulphuric acid has also been used for similar purposes, diluting it to the extent of one part of acid to three or four of water. In thin skinned animals the weaker preparation ought to be preferred, and caution must be exercised in using such preparations so as not to destroy the tissues on which they are applied. Another method of treatment is, after the contents of the sac have been returned into the abdomen, to tie a piece of strong waxed cord around the pendulous portion which formed the outer covering of the hernia. The string is apt to slacken after two or three days, when a new piece of cord should be applied above the first one. The constriction of the skin sets up inflammation which generally extends to the umbilicus and causes the edges to adhere together, and by the time the portion of the skin beneath the ligament has lost its vitality and dropped off, the umbilicus is closed and there is no danger of the abdominal organs protruding through. This is what takes place when this method has a favorable result, though if the umbilicus does not become adherent the skin sloughs, the bowels will protrude through the opening. None of these measures should be attempted by any but a competent veterinarian.

Wounds of the Abdomen.

When only penetrating the skin such wounds are not dangerous, and we shall therefore here consider merely those wounds which penetrate the entire thickness of the abdominal walls and expose to a greater or lesser extent the organs contained in this cavity.

Causes.—Such wounds may be occasioned by animals falling on broken glass fragments or other sharp objects; blows from the horns of other animals, or incautious use of caustics in the treatment for hernia may produce them. The parts generally escaping through such wounds are the small intestine and floating colon.

Symptoms.—When wound is small the bowel exposed presents the appearance of a small, round tumor, but a few moments afterward a loop of intestine may escape from the opening. The animal then shows symptoms of severe pain by pawing with his feet, which has the effect of accelerating the passage of new loops of intestine through the wound, so that the mass which they form may even touch the ground. The pain becomes so great the ox now not only paws the ground but lies down and rolls, thus tearing and crushing his bowels. In such cases it is best to slaughter the animal at once; but in the case of a valuable animal, in which the tearing and crushing has not taken place, the bowels should be returned and the wounds in the muscle and skin brought together in a manner somewhat similar to that which has been described in speaking of common hernia.

Jaundice, the Yellows, Congestion of the Liver.

Jaundice is indicated by a yellowish appearance of the white of the eyes, and the membrane of the mouth. A swollen condition of the membrane of that part of the bowel called the duodenum may produce jaundice. In constipation there is an inactive or torpid condition of the bowel, and the bile which passes into the intestine may be absorbed and cause the yellow staining of jaundice.

Jaundice is one of the symptoms of Texas fever and depends on the congested condition of the liver existing in that disease. It may also arise from injury to the nervous system, or from parasites and gall stones present in the bile ducts, obstructing the onward flow of bile. The conditions under which cattle most frequently need treatment for bile is when they have been highly fed and kept in a state of inactivity. At such times there is an excess of nutritive elements carried into the blood, which is associated with increased fulness of the portal vein and hepatic artery.

Symptoms.—The disease is most common among stall fed cattle. Appetite is poor; pressure along the margin of the short ribs on the right side produces pain; the animal drinks little or nothing. The membranes of the eye and mouth are yellow, the urine is yellow or brownish in appearance; the animal prefers lying down, and moves with reluctance, moans occasionally and has a tottering gait. Ears and horns are alternately hot and cold. In cows the secretion of milk is much diminished, and what is secreted is bitter to the taste. Sometimes the animal has a dry, painful cough, and presents a dull, stupefied appearance.

Treatment.—Prevention is better than a cure, here as elsewhere, and Davis Stock Food, if used regularly with the ration, will usually prevent jaundice. If, however, the disease has been allowed to come on, it is advisable in the treatment first to produce a free action of the bowels, so as to remove the usually congested condition of the portal vein and liver. For this use the following dose: Sulphate of soda, 16 ounces; fluid extract of taraxacum, $\frac{1}{2}$ ounce. Dissolve the sulphate of soda by stirring it up in 2 quarts of tepid water. The extract of taraxacum is mixed with it, and the mixture should be administered as one dose. When a purgative action has been produced, 1 dram of sulphate of cinchona, $\frac{1}{2}$ ounce of fluid extract of taraxacum and 1 ounce of spirits of nitrous ether may be shaken up in 1 pint of water, and given night and morning for several days in succession. This treatment may be assisted by giving occasional injections of soap and warm water. Let the diet be laxative, and moderate in quantity—coarse bran mash, pulped roots, grass in season and hay in moderate quantities; with each feed give 2 tablespoonfuls of Davis Stock Food, and after the digestive and assimilative functions have been regulated, 1 tablespoonful to each feed.

Hepatitis,

or inflammation of the liver, is a more advanced stage of the disease just described. It is frequently restricted to a certain part of the liver, the rest of the organ being healthy.

Symptoms.—Yellowishness of the eye and of the membrane lining the mouth; poor appetite; body presents an emaciated appearance, but there is frequently a fulness of the lower part of the abdomen. The gait is weak and the animal lies down more than usual, and while doing so frequently has its head turned around resting on the side of its chest.

Treatment.—One-half pound of sulphate of soda and $\frac{1}{2}$ ounce of fluid extract of taraxacum should be mixed with 2 quarts of tepid water, and this should be given night and morning until a relaxed condition of the bowels is produced, as the object is not to produce a strong purgation but a laxative effect which should be continued for some days. The diet should be similar to that recommended in speaking of congestion of the liver, with 2 tablespoonfuls of Davis Stock Food added to each feed. After the treatment with laxatives has been continued for several days, 1 dram of sulphate of cinchona and 1 dram of dilute nitromuriatic acid should be shaken up in 1 quart of cold water and this dose should be given three times a day until the animal has regained its strength. Oil of turpentine, or, better still, Davis Veterinary Liniment, should be rubbed in well once a day over the region of the liver. The skin on which it should be applied extends from the false ribs on the right side to 6 inches in front of the last one, and from the backbone to 12 inches on the right side of it. Extreme heat and pasturing animals on low lying ground are conditions favorable for the production of this disease.

The Fluke Disease is caused by a parasite which infests the biliary ducts of the liver. It varies in size from $\frac{3}{4}$ of an inch to a little over an inch in length and has a brownish flattened body. It belongs to the group of so called trematoda, or sucking worms.

The fluke passes through several different stages of development, before it reaches the liver of the animals which it infests, and is not only found in cattle, but in sheep and several species of wild animals. Parasites which have attained their full size usually after a time pass out of the animals in which they have been harbored, and die, when they have attained the limit of their existence. It has been estimated that after the death and decomposition of one full grown fluke upward of 40,000 eggs will be liberated from its uterus. The agency of winds, rains, insects, the feed of cattle and other animals, disperse and carry these ova to considerable-distances, so that a large proportion of them find their way to pools, ditches, and streams, where the conditions exist necessary to their future development. After a time they reach the stage in which they are transferred with the fodder or drink to the digestive organs of their host. It will be understood from this that the disease mainly prevails on low, swampy lands, and especially on land which is subject to inundation. During a wet, rainy season the area over which it extends becomes much wider, and the losses which the disease occasions are consequently greater.

Treatment.—The presence of these parasites in the biliary ducts does not at first seem to impair the health of the animal; indeed, it has been stated that for a short time the animal appears to thrive better. This is accounted for by the statement that the presence of the flukes in the biliary ducts stimulates the secretion of the bile; that this occasions a more complete digestion of the fatty elements of the feed, and a consequent improvement in the animal's condition in the early stage of the disease. When the flukes attain their full size, however, and are present in a large number, they set up inflammation in the walls of the biliary ducts. As a result of these parasites the liver becomes indurated and its secreting structure becomes atrophied and wasted. The animal becomes dull and weak, swellings of a dropsical nature form between the jaws and along the throat. There is fever, great emaciation, and dropsical accumulations in the chest and belly, which are soon followed by death. Treatment is usually of no avail. Preventive measures, aiming at always keeping the digestive and assimilative functions of the animal in healthy condition and the circulation full and uninterrupted, will, however, do much to obviate the contraction of this malady; and if you always keep Davis Stock Food at hand, feeding it in the proportions of 1 tablespoonful to each full grown cow and $\frac{1}{2}$ tablespoonful to the calves in your herd, you will, under all ordinary conditions of sanitation and hygiene, practically insure your cattle against flukes. Once, however, an animal has contracted the disease you may as well kill it as soon as possible.

DISEASES OF THE PERITONEUM.

Peritonitis

may be divided into certain varieties, according to its mode of causation: (1) traumatic, when the disease arises from wounds penetrating the abdomen; (2) idiopathic; when the disease arises from exposure to cold and wet. The second variety of peritonitis occurs chiefly among working oxen. Sudden chilling of the skin may bring it about.

Causes.—If you work up your oxen into a sweat and thereafter for a time allow them to stand exposed to cold winds or rain, the surface of their bodies will soon become chilled. In the same way, when you drive your cattle through rivers or into ponds, so that their bodies become wet, and they afterward lie on the ground when the weather is cold, such exposure is likely to bring on an attack of peritonitis. The disease may also be caused by wounds penetrating the abdomen.

Symptoms.—Either continuous or occasional shivering; the animal lies down but appears uneasy; it frequently turns its head toward its belly and lows plaintively; pressure on the flanks produces pain; the animal has no appetite, muzzle is dry and rumination suspended; while standing its legs are placed well under the body; the pulse is small and hard. If this disease is complicated by the presence of

inflammation of the bowels the pain is more severe and the animal is restless. The skin is cold and dry in the early stages of the disease, but in a more advanced stage this condition may be succeeded by heat of the skin and quick breathing. The fits of trembling, uneasiness, small and hard pulse and tension of the left flank are symptoms, the presence of which should enable one to reach the conclusion that peritonitis exists.

Treatment.—In the traumatic form of peritonitis, as when the horn of another animal has been thrust through the abdominal walls, the lesion must be treated in accordance with the directions heretofore given, but the general treatment is outlined below. Peritonitis, resulting from castration or from parturition fever, must also be treated in connection with the special conditions which give rise to it, as the general treatment for this disease must be modified to some extent by the existing cause. The body should be warmly clothed, and it is advisable when practicable to have a blanket which has been wrung out of hot water placed over the abdomen, then covered by several dry blankets, which are maintained in position by straps and ropes passing around the body. The wet blanket must be changed as it cools, the object of the treatment being to warm the surface of the body and to carry as much blood as possible to the skin. After the clothing of the body has been attended to the aim of the treatment should be as follows: (1) to obtain rest for the affected parts; (2) to subdue inflammation and fever; (3) to sustain the animal's strength. There is nothing better known for the treatment of peritonitis than Bradbury's Brazilian Specific, given as directed. It is possible, though, that the stockman may not have it on hand, in which case the following treatment should be given: An ounce and a half of laudanum or powdered opium. An ounce and a half of the first or a dram of the second may be given in a pint of tepid water, and if the pain is not perceptibly allayed the dose should be repeated in two hours. It is dangerous to give purgatives in peritonitis as they stimulate the movement of the bowels, increase the suffering and aggravate the disease. Tincture of aconite should be given in 10-drop doses every two hours for the purpose of reducing fever and inflammation. Bleeding for this purpose has been recommended, but should only be applied by a veterinarian when the pulse is strong and the animal is in good condition, bearing in mind that if the inflammation has existed for two days, it cannot have any beneficial effect, but the reverse. Let the diet consist of laxative feed and drinks, and always add Davis Stock Food, 2 tablespoonfuls to each feed, to the ration in order to insure easy digestion and passage through the alimentary tract. Linseed tea may be given with advantage. If peritonitis assumes chronic form the diet should be nutritious, such as hay, corn stalk leaves, linseed cake, and Davis Stock Food, grass, etc., and iodide of potassium should be given in dram doses dissolved in 1 pint of water.

Dropsy of the Abdomen,

or Ascites, is a disease indicating a serous or watery effusion in the cavity of the abdomen.

Causes.—Old animals worked and fed on innutritious feeds become what is termed anemic; in other words, their blood becomes impoverished and dropsy is a common result. The same effect may also be produced in young animals. Exposure of cattle to sudden changes of temperature and the chilling effect of cold and wet acting on the skin may produce the disease. Peritonitis may cause it or it may result from acute or chronic inflammation of the liver. When resulting from disease of the liver, it develops slowly, and this is also the case when insufficient feed is the cause.

Symptoms.—Gradual increase in the size of the abdomen at its lower part, while the flanks become hollow; pallor of the mucous membrane of the mouth and eyes; weak and sluggish gait; want of appetite and irregularity in ruminating. If the hand and arm are oiled and passed into the rectum as far as possible, on moving the hand from one side to the other, the fluctuation caused by the presence of the fluid in the abdomen may be felt.

Treatment.—Nutritious diet, adding Davis Stock Food, 2 tablespoonfuls to each feed, to the ration. In cases where the disease was caused by insufficient nutrition, this generally will be all the treatment necessary. It should be remembered that Davis Stock Food acts at the same time as a tonic, gently stimulating all the organs of the body; as an appetizer, doubling the action of the kidneys and lymphatic glands, thus carrying off the fluid; and as a digestive, acting directly upon the glands of the stomach and alimentary canal, causing the animal to assimilate every morsel of the digestible feed that passes into the stomach. Especially if the disease is pronounced, Davis Stock Food in double doses should be

mixed with the animal's feed three times a day; or, if there is any uncertainty of its being taken that way, it should be mixed with syrup, so as to form a paste, and smeared well back on the animal's tongue with a flat wooden spoon. The administration of purgatives, which promote a watery discharge from the mucous surface of the bowels, also tends, by diminishing the serum of the blood, to bring about absorption and a gradual removal of the fluid contained in the abdomen. Large doses are not recommended; give moderate doses morning and night, so as to produce laxative effect on the bowels for some days. To attain this the following may be used: Sulphate of soda, 8 ounces; powdered ginger, $\frac{1}{2}$ ounce; mix in 2 quarts of tepid water, and then give at one dose. If Davis Stock Food is used regularly the above treatment will, as a rule, be unnecessary.

DISEASES OF THE DIGESTIVE ORGANS.

Poisons. Poison is a word the exact defining of which, according to the best authorities, is not quite possible. So much so is this the case that even in law it has never been possible to clearly define it, and whenever we attempt to explain its simple meaning we always are prone to include either too much or too little in our statement. Here is about as lucid and graphic definition as has yet been given by science: "A poison is a substance having an inherent deleterious property, rendering it capable of destroying life by whatever avenue it finds access to the system; or, it is a substance which, when introduced into the system or applied externally, injures health or destroys life, irrespective of mechanical means or thermal changes." And the popular conception of a poison is any substance which will destroy life, in small quantity, excepting such as act by purely mechanical means, as, for instance, powdered glass. We know that poison, especially, is something which we must always be on our guard against and careful in handling.

The Action of Poisons may be either local, exerted directly on the tissues with which they come in contact, or remote, acting through the circulation or nervous system; or both. Local and remote action may be exerted by the same drug. Poisons acting locally generally either destroy by corrosion the tissues with which they come in contact, or by inhalation set up acute inflammation. If a corrosive agent is taken into the stomach in poisonous quantities a group of symptoms is developed which is common to all. It destroys the tissues with which it comes in contact, sloughing and acute inflammation of the surrounding structures takes place; this is followed by intense pain in the abdomen, ending in death. In the same way, but with less rapidity, a similar result is reached if the agent used be not of a sufficiently corrosive nature to destroy the tissues, but sufficiently irritating to set up acute inflammation of the mucous membrane of the digestive tract. Of the poisons exerting a remote influence, the action is quite different, little or no local effect being produced upon the digestive organs. The poisons when absorbed and transmitted through the agency of circulation, exert their baneful influence, and though some of them act with extreme rapidity, no effect can be produced until the agent has been absorbed. The poisonous effect of any substance is modified by the quantity used; by its chemical combinations; by the part of the animal structure with which it comes in contact; and also by the physical condition of the subject. For instance, opium may be given with safety in much larger doses to an animal suffering from acute pain than to one free from pain, and to an adult animal with greater safety than to a young one. The rapidity with which the poison is absorbed, owing to the part of the body with which it comes in contact, is also of importance. So marked is this, that some poisons having the power of destroying life with absolute certainty when introduced beneath the skin, may safely be taken into the stomach, causing no inconvenience at all, as, for example, curara, the arrow poison, or the venomous secretions of the fang of the snake. Other agents in chemical combination may tend to intensify, lessen, or wholly neutralize the poisonous effect. Thus, arsenic in itself has well marked poisonous properties, but when brought in contact with dialyzed iron it forms an insoluble compound and becomes harmless. Idiosyncrasies are not so noticeable in cattle practice as among human beings, but the

uncertainty with which some drugs exert their influence would lead us to believe that well marked differences in susceptibility exist. Even in some cases a tolerance for poison is engendered, so that in a herd of animals equally exposed injurious or fatal effects do not appear with uniformity. Thus, among cattle that are compelled to drink water holding in solution a salt of lead, the effect of the poisoning will be found varying all the way from fatality to imperceptibility. To reduce these symptoms and conditions to anything like an exact science has, however, so far, not been quite possible, and no set standards or rules are laid down to determine accurately the cause and effect that govern this phenomenon.

The General Symptoms of Poisoning.

These vary so greatly in the different poisonous agents that it is nearly impossible to give even a general rule of symptoms which adapts itself to all cases. As a rule, poisoning is not suspected until after death. It is necessary to determine the presence or absence of poison in the system, especially in order to arrest its effect on other animals which may have been exposed in the same way as the victim, or, among men, to promote the ends of justice in criminal jurisprudence. The symptoms exhibited before death are likely to give reason to suspect either intestinal irritation, with manifestations similar to those of colic, or disordered brain function with the characteristic indications of vertigo, coma, paralysis, dilatation, or contraction of the pupil, etc. The animal secretions or excretions may be perverted, augmented or suppressed. It usually takes a chemist to determine with absolute certainty the presence of many of the poisons. But at the same time diagnosis may be reached with reasonable certainty where the previous history of the case is known, as well as the surroundings and the poisonous agents to which the animal would be most likely to have access. To ascertain this and treat accordingly will to all intents and purposes serve the end of the farmer, whose main care is that of saving his animal and guard the remainder of the herd against being poisoned in a like manner.

Treatment.—The following is but an attempt to broadly outline a treatment, or a series of treatments, that in a general way will conform to the requirements of the most common forms of poisoning applying to a majority of cases, and which may be tried, as a rule, with good results. Have a stomach pump at hand. This will pay all raisers of stock, and when indications of poisoning appear in an animal you should lose no time in emptying the stomach of its contents and carefully washing the organ by either injecting pure water or a solution of the proper antidote. If the stomach cannot be emptied the antidote should be administered which will counteract or neutralize the particular poison from which the animal is suffering, such as powdered chalk to neutralize acid poisoning. If the poison has been taken in solid form and there is a probability that part of it is still undissolved, its further destructive action may be stopped by the administration of mucilaginous drinks, as for instance, infusions of flaxseed, white of eggs, acacia (gum arabic), etc. Where the poison is known to be one that will not exert its influence on the stomach directly, but remotely, every effort should be made to neutralize any part of it that may remain unabsorbed, and to, so far as possible, fortify the system against its action, as by the use of atropia in opium poisoning, or the placing of the patient under the influence of chloroform or ether when poisoned by strychnine. A poison may be so gradually introduced into the system, as to slowly develop the power of resistance against its action. In other cases, where the poison is introduced slowly, the poisonous action becomes cumulative, and, although there is no increase in the quantity taken, violent symptoms are suddenly developed, as if the whole amount, the consumption of which may have extended over a considerable period, had been given in one dose. And there are other poisons, not necessarily fatal, but which tend to deteriorate and impair the functional activity of some of the important organs of the body, thus producing ill health. These are called chronic poisons. It is also well for the farmer to know that poisons, in themselves dangerous when administered in large doses, are used medicinally for curative purposes, and that a very large percentage of the pharmaceutical preparations used in the practice of medicines if given in excessive quantities might produce serious results. In the administration of medicines, therefore, care should be taken, not only that the animal is not poisoned by the administration of an excessive dose, but, that injury is not done by continued treatment with medicine, the use of which is not called for. In all common cases the prompt use of the stomach pump, washing out of the stomach according to the direction given above, will do the work; and when this occasionally fails use the antidote. In all serious cases, where the stomach pump fails to work, or when you have not been instructed in its use, call in a veterinarian.

In the case of lead poisoning the treatment should first be directed toward removing the cause. If you have no stomach pump give a large dose of purgative medicine: Bromide of potassium in $\frac{1}{2}$ -ounce doses every four or five hours, and applications of cold water to the head. Dilute sulphuric acid in $\frac{1}{2}$ -ounce doses mixed with $\frac{1}{2}$ pint of water should be given with the purgative medicine. Epsom salts is the best purgative in this case, and may be given in doses of from 1 to 2 pounds, dissolved in warm water. After the acute symptoms have abated, iodide of potassium may be given in doses of 2 drams each, dissolved in water, three times a day for a week.

In acid poisoning any of the alkalies may be used as an antidote; chalk, whiting, baking soda, etc., are usually most convenient. Empty the stomach as quickly as possible. This holds good both for mineral and vegetable acids.

As an antidote against mercurial poisoning, one of the most terrible of corrosive poisons, which is fatal even in very small doses, the white of eggs has the power of completely neutralizing its poisonous effect, providing it is administered before the poison has had time to exert its deadly influence. In using the remedy separate the white from the yolk of eggs, mix it with water, and give in large quantities; after its administration the stomach should be emptied by means of a stomach pump.

For alkaline poisons, which rank side by side with mineral acid poisons in destructiveness to their victims, the treatment should be the unloading of the stomach as promptly as possible by means of the stomach pump. If this cannot be done the poisonous effect of the alkali may be neutralized by the administration of dilute acids. The administration of such an antidote and its action must be carefully watched during administration. In the chemical change which takes place when the acid and alkali are combined, carbonic acid gas is liberated, sometimes to an extent causing considerable distention of the abdomen, even amounting to asphyxia from pressure forward on the diaphragm. Should this danger present itself it may be averted by opening the left flank, permitting the gas to escape.

Coal oil given in too large doses as a treatment for intestinal parasites produces poisonous effects, often followed by death. Against this condition use mild stimulants, such as aromatic spirits of ammonia or strong coffee in large quantities. Encourage the animal to eat soft, mucilaginous feed, to which Davis Stock Food has been added. The best remedy is to prevent the poisoning by abstaining from the use of coal oil for the purpose mentioned.

Carbolic acid, although one of the most valuable antiseptic remedies known, when taken internally, or used over a large surface externally, is likely to produce a poisonous effect. As an antidote internally under such circumstances, lime water sweetened with sugar should be given in large quantities, or a solution of sulphate of soda. When the poisoning occurs through too extensive application to wounds or the skin, as in treatment of mange, cold water should be freely applied so as to wash off any of the acid that may still remain unabsorbed. As a surgical dressing a 3 per cent solution is strong enough for ordinary purposes. Remember that Phenalin is a much more effective dressing and no danger accompanies its use.

In the case of opium poisoning the stomach should be emptied by means of a stomach pump, if possible, and the patient kept moving, even though what would otherwise be cruelty is necessarily inflicted. When other means fail to excite, sharp blows close to the ear will sometimes serve to arouse. Give stimulants internally, such as whisky, aromatic spirits of ammonia, brandy, and strong infusions of coffee.

For strychnine poisoning empty the stomach if it can be done before the poison is absorbed, but after the spasms occur it may excite the animal and hasten a fatal termination. In such a case the best method is to put the patient under the influence of ether or chloroform, and keep it there continuously until the effect of the poison has worn off.

Aconite poisoning, likely to occur on any farm, as for some years past aconite has become a more popular stable remedy, should be treated with the stomach pump, and the animal thereupon treated with finely powdered animal charcoal in the hope of absorbing the poison. The only chemical antidote of value is tannic acid, which forms an insoluble compound with the aconite. The depressing effect on the heart should be counteracted by the use of ammonia, digitalis, and other diffusible stimulants, which have a physiological effect opposite to aconite.

Poisons also are likely to find their way into the system in the feed the animal consumes, coming under the name of dietetic poisons. Thus the loco weed (*Astragalus mollissimus*), found in the natural pastures of some of our western states and territories, produces a remarkably poisonous effect. The plant grows on high, gravelly or sandy soil. It has rather an attractive appearance and retains its soft, pale green color all winter. A mass of leaves, 4 to 19 inches high, grow from the very short stem. The leaves are pinnated similar to those of the locust tree, with ten pairs of leaflets and an odd terminal one. The flowers, shaped like pea blossoms, appear in June or July, are yellow, tinted with violet. The seed is contained in a pod about half an inch long. Horses and cattle acquire a taste for it, although it is not a plant that would be considered as feed, or that would be eaten with relish the first time. In early spring when the herbage is scarce its green appearance may attract the animals, and the habit is thus acquired. Its effect is not noticeable until a considerable quantity has been eaten, when it works as a poison on the nervous system. If the case is permitted to go on the animal becomes more and more addicted to feed on the plant, until it will eat nothing else. It becomes excitable, convulsions appear at intervals, the eyes are glassy and staring, gait slow and measured, and by degrees the victim becomes delirious, violent and vicious in spells until death occurs. Treatment in time, by removing the cause, will cure the effect. No medical treatment is of any use. Quiet stabling, with a liberal supply of feed, to which is added Davis Stock Food, in the proportion of 2 tablespoonfuls to each feed, will counteract the poison and bring the cow about.

Ergot also has a poisonous effect on cattle in the winter and spring of the year. The bovine species seems to be more susceptible than all other animals to the influence of ergot, possibly on account of the slowness of the heart's action. When the effect has been sufficient to entirely arrest the circulation in any part of the body the structures soon die. The disorder manifests itself in lameness in one limb or more; swelling about the ankle, etc., causing what is known as dry gangrene. The treatment should consist in change of feed, adding Davis Stock Food to the ration, and local antiseptics, such as Phenalin. It is best to prevent the disease by taking steps against it as soon as the first symptoms show; once affected it is a tedious and slow process to eradicate the poison from the system of the cow. It has been asserted by some that the feeding of corn with ergotized feed will neutralize the poisonous effect.

Local Poisons may occur from the bites or stings of insects or from contact with poisonous plants on exposed parts of the body, such as poison ivy (*Rhus toxicodendron*), when brought in contact with the udder or teats, or from the application of caustic acid or alkaline solutions. In the case of the caustic, its effect should be neutralized by the application of the proper antidote and the resulting wound treated with Phenalin, as a burn or frost bite. The stings of bees or wasps and the bites of other poisonous insects should be treated by the application of Phenalin or turpentine gently applied.

Snake Bites act often as powerful poisons on their victim, resulting in serious local irritation, and in the case of the most venomous and poisonous snakes even in the causing of death. This the poison may do in two ways. First, when very strong, by exerting a narcotic influence similar to that of other powerful poisons, destroying nervous function, with the symptoms of extreme depression, feeble flickering of intermittent pulse, cold extremities, dilated pupils, insensibility, collapse and death. Second, when less powerful, by diffused inflammation of the areolar tissue, numerous abscesses, gangrene, and extensive sloughing. Local swelling occurs immediately after the bite, there is severe irritation, the extent of the swelling and subsequent gangrene depending on the potency or amount of the poison introduced. Unless in very large quantities, death ensues so rapidly that the swelling process is not completed. There are, however, many snakes whose bite is harmless. If an examination is made after death of an animal succumbed to snake bite, a dark alkaline condition of the blood, intense congestion of the lungs and spleen, and other conditions indicative of death of the blood will be found. The viscera emit a peculiar, sickly odor. The muscles are contracted from the death convulsions attending upon the poisonous bite.

Treatment should be local and general. Locally use every effort to prevent the absorption of the poison. If discovered at once, the bitten part had better be excised or cut away. If that is impracticable and a ligature can be applied, as in the case of a bite to one of the limbs, no time should be lost in applying it above the injury. It should be made so tight that it will, so far as possible, arrest

the circulation to and from the bitten part. The poison should be extracted by cupping. If this is impracticable, or after it has been done, sear the wound with a red hot iron to destroy, so far as possible, any of the poison that may remain unabsorbed. The depressing effect on the system by the poison should be counteracted by liberal drenching with stimulants—wine, brandy, whisky, etc. In the human being preparations of arsenic, bromine, bichloride of mercury, and iodide of potassium in frequently repeated doses are recommended. In animal practice alcoholic stimulants, as recommended above, have been most successful. In the emergency which arises when such an accident occurs the means at hand must be used to the best advantage. First, the application of a tight ligature can nearly always be made; then opening the wound to the bottom with a penknife and encouraging the flow of blood will be likely to wash out at least part of the poison, if done promptly. Cupping cannot be practiced among cattle with the same facility as among human beings, owing to the covering of hair. This obstacle may be overcome by smearing the hair full of tar or balsam on the surface to which the cupping glass is to be applied. The operation may be easily performed, using a jar or a bottle with a good sized neck, but not so large as to prevent its having a firm seat on the skin around the wound. A piece of cloth dipped in oil and lighted is dropped into the bottle, the neck of which is quickly applied to the wound. The flame of the burning cloth consumes the oxygen of the air and creates a partial vacuum into which the blood from the wound should flow freely. The injection hypodermically of a 20 per cent solution of permanganate of potash directly into the wounded tissues aids in neutralizing the effect of the concentrated poison in the immediate vicinity. After the treatment carefully wash the wound with a solution of Phenalin and tepid water. Keep the digestive organs and the circulation of the patient in order by using Davis Stock Food with the feed ration. We commend the farmer and stockman to carefully read and remember this chapter on poisons, so that when the emergency comes he may be prepared to apply the various methods of treatment given, thereby saving many valuable animals that would otherwise be lost to him.

DISEASES OF THE HEART AND BLOOD VESSELS.

Pericarditis,

or inflammation of the pericardium (heart sac), is often associated with pneumonia and pleurisy, rheumatism and other constitutional diseases. But it also occurs as an independent trouble brought about by causes similar to those of other chest affections, as exposure to cold or dampness, chills, changes of weather, drifts, etc.

Symptoms.—It may come with a chill, followed by fever, of more or less severity. The animal stands still, is dull, the head hangs down, its expression is anxious. Pulse may be large, perhaps hard; there is also a venous pulse. If you put the hand against the chest you will feel the beating of the heart, which is often irregular, sometimes violent, and in other instances weak. The legs are cold; breathing quickened, and usually abdominal; if you press on the left side of the chest, or strike it, the animal will evince much pain (remember that most of these symptoms are also seen in the case of pleurisy, and care must be taken to distinguish between the two). There may be spasms of the muscles in the region of the breast, neck or hind legs. After a time, which varies in length, the legs may become swollen, and the swelling is also likely to occur under the chest and brisket. In those animals in which the heart-sounds may be heard somewhat distinctly, the ear applied against the chest will detect a to and fro friction sound corresponding to the beats of the heart; this sound is produced by the rubbing of the internal surface of the heart sac against the external surface of the heart. During the first stages of the inflammation these surfaces are dry, and the rubbing of one against the other during the contraction and relaxation of the heart produces the to and fro friction sound. The dry stage is followed by the exudation of fluid into the heart sac, and the friction is not heard until the fluid is absorbed sufficiently to allow the surfaces to come in contact again. A churning noise may take the place of the friction sound. If the friction sound does not return, adhesion of the surfaces may be suspected. The friction sound of pericarditis cannot be mistaken for the friction sound of pleurisy, if the examination is a careful one, because, in the heart affection, the sound is made in connection with the heart beats, while in pleurisy the sound is synchronous with each respiration or breath of air taken into or expelled from the lungs.

Treatment.—If pericarditis is complicated with rheumatism or other diseases, they must be treated as indicated in the description given of them. The animal should be kept in a quiet, comfortable place, where it will be free from annoyance or excitement. Apply warm clothing to the body, and rub the legs vigorously with the hand until the circulation in them is reestablished; then bandage them snugly. Let the feed be of nutritive quality and moderate in quantity, adding Davis Stock Food, 2 tablespoonfuls to each feed. This will insure perfect digestion, assimilation and attendant circulation, and will speed the animal on the road to recovery. In the way of medical treatment (which, if the disease is taken in time, and Davis Stock Food fed regularly, may in all but severe cases be dispensed with), at the beginning give as a purgative, Epsom salts, 1 pound dissolved in about 1 quart of warm water and administered as a drench. When there is much pain, 2 ounces of laudanum, diluted with 1 pint of water, may be given every three hours, until relief is brought about. Do not give the laudanum unless demanded by the severity of the pain. After attack abates use mustard mixed with water; rub well over left side of chest. Try to prevent the occurrence of the disease in your cows by proper care and feeding. Davis Stock Food, 1 tablespoonful to each feed in health, will go far to insure the animals against disease.

Myocarditis.

An inflammation of the muscular structure of the heart. Probably always connected with pericarditis and endocarditis.

Endocarditis.

An inflammation of the membrane lining the cavities of the heart. Usually a complication of rheumatism. Symptoms much the same as those of pericarditis. Same treatment as for pericarditis may be followed. Nourishing feed, with Davis Stock Food added, rest, quiet, fresh air, etc.

Hypertrophy of the Heart.

An enlargement of the heart. Sounds of the heart are high and pronounced, and may be heard on both sides of the chest distinctly. There is palpitation to a greater or lesser extent. A rare disease in cattle.

WOUNDS OF ARTERIES AND VEINS.

When a blood vessel is opened you can tell at a glance whether it is an artery or a vein by remembering that bright red blood comes from arteries and dark red from veins. In severing a small artery the blood flows from it in a continuous, even stream, but if you cut one of the large arteries it comes in jets and spurts. The general treatment for wounds will be found on another page. We shall here but refer briefly to some of the most practical methods used in arresting hemorrhages.

Hemorrhage.

The seriousness of a hemorrhage depends upon the size of the vessel from which the blood escapes. It is most serious in severed arteries. Slight hemorrhages may be checked by continuous application of cold water to the wound, ice, snow, etc. You may throw the water on the wound from a hose, or dash it on with the hand, or from a cup. Folds of cotton cloths may be held to wound and kept wet. Hemorrhages of vagina and womb may be arrested by injecting hot water, 115 to 120 degrees Fahrenheit in temperature. Tow, raw cotton, lint, or sponges may be forced into a wound and held or bound there with a bandage. If blood persists saturate bandages with tincture of iron. Do not use this except when absolutely necessary as it retards the healing. In all serious cases, after administering the first aid, call in an expert veterinarian. Mild hemorrhages and wounds you can treat yourself. The best means is compression. To most wounds bandages may be easily applied. Make the bandage of linen, muslin, etc., sufficiently wide and long to cover the wound. Bed sheets torn in strips are good for this purpose. Cotton batting, tow, or a piece of sponge may be placed on the wound and held in place by the bandage. When necessary (as in the case of snake bites) ligate the vessel. In this case tie the ligature around the end of the artery. When this is difficult, include some of the surrounding tissue. Do not ligate any but large vessels (and even then only when other means are not available), as it causes danger of inflammation. To apply a ligature you should have a pair of artery forceps (tweezers or small pincers may do) by which to draw

out the artery in order to tie the string around it. Sponge the blood from the wound to find and grasp the artery. If the end of the vessel has retracted a sharp pointed hook, called a tenaculum, is used to draw it out far enough to tie. In all serious cases let your veterinarian attend to this. In cases of wounds to small vessels another method of checking called torsion may be applied. Catch end of the bleeding vein, draw it out a little, then twist it around a few times with the forceps. This lacerates the internal coats, effecting a check of the blood. In small vessel it is very effectual and to be preferred to ligatures, as it leaves no foreign substance in the wound. A needle or pin may be stuck through the edge of the wound, and a string passed around between the free ends and the skin drawing it together.

Aneurism

is a circumscribed dilation of an artery, due to disease and rupture of one or two of the arterial coats. True aneurism communicates with the interior of the artery, and contains coagulated blood. No treatment is possible for this disease.

Varicose Veins

are due generally to coagulated blood in the veins, producing sacculated or knotty protuberances on the blood vessels affected. The formation of these coagula is an effect of inflammation in the coats of the vein; this inflammation may be slight or may run on to suppuration, giving rise to small abscesses. Underfed cattle, or animals kept in wet, cold places, are especially liable. Cause seems to be debility of circulation, want of tone in the coats of the vessels, etc.

Treatment.—Better feed, Davis Stock Food, 2 tablespoonfuls to each feed, to restore proper circulation and digestion; tonics and pressure by bandages. In case of suppuration open the abscesses, apply Davis Veterinary Blister, or any other reliable blister. Do not use pressure.

Air in the Veins.

Owing to the suction action in the chest, when a large vein is opened in the vicinity of the chest air may be sucked in, which, if in great quantity, will cause death.

DISEASES OF THE ORGANS OF RESPIRATION.

Catarrh,

or cold in the head, is an inflammation of the membranes of the nostrils and upper air passages. Simple catarrh is not serious. If neglected, however, it is liable to complicate with laryngitis, bronchitis, pneumonia, pleurisy, etc., becoming serious, sometimes fatal. Catarrh is a common cattle disease.

Symptoms.—Redness of membranes of nose; red and watery eyes; mucous membrane first becomes dry, then watery discharge appears. Discharge becomes mucopurulent in severe cases. Little or no fever in mild cases; in severe cases fever may run high. Animal becomes dull, languid, disinclined to move about; appetite poor; temperature variable. In milch cows secretions become diminished, mucus from the eyes and nose becomes thicker and yellower.

Treatment.—House the animal in a well ventilated place, with good hygienic surroundings. Keep warm with blanketing in cold, damp weather. Give hot, medicated inhalations of Phenalin in severe cases. Bradbury's Brazilian Specific or Davis Distemper Cure are a positive cure for the fever. If this is not at hand give nitrate of potassium, from 1 to 2 ounces, in drinking water, three times daily until fever is reduced. Good nursing, with Davis Stock Food added to the feed ration, is indispensable.

Epistaxis,

or bleeding from the nostrils, is rare in cattle. It is usually caused by injury to the mucous membranes, violent exertions, in coughing and sneezing, etc. Seldom serious.

Treatment.—Generally it will stop of itself. Keep the animal quiet and bathe head and nostrils with cold water. Find cause of bleeding and treat accordingly. In unusually severe cases tie animal's head to a high rack or beam and apply cold water, ice, etc. If the hemorrhage still persists give a drench composed of 1½ drams of acetate of lead dissolved in 1 pint of water.

Laryngitis, or Sore Throat, is an inflammation of the membrane lining the larynx. May be either primary or secondary, complicated or uncomplicated. Due usually to sudden exposure, change from warm to cold, wet weather, storms. May also result from inhaling irritating gases, or external violence. In acute cases there is an elevation of temperature, pain when pressing on larynx, coughing, noisy and difficult respiration. Nostrils are dilated, nose extended; animal looks frightened; swallowing is difficult.

Treatment.—Fomentations and hot applications over the throat. Stimulating liniments, such as Davis Veterinary Liniment, mustard, or other counter irritants should be used in severe cases. Electuary (soft or solid) medicines alone should be given. Large drafts of medicine produce violent coughing and should not be given. Davis Distemper Cure, a heaping tablespoonful placed well back on the tongue, will usually cure the most obstinate case. If this is not at hand, try the following: Aloes, powdered opium and gum camphor in equal parts; mix. Rub an ounce on the molar teeth every four hours. Or give internal treatment: Chlorate of potassium, pulverized, 8 ounces; fluid extract of belladonna, 2 ounces; powdered opium, 1 ounce; powdered licorice root, 8 ounces; syrup, sufficient quantity; mix. At frequent intervals place a small tablespoonful on tongue or back teeth. Keep digestion in order and bowels open by feeding Davis Stock Food with the ration, 2 tablespoonfuls to each feed. Diet should be such as patient can easily swallow; warm sloppy mash, boiled oatmeal gruel and linseed tea are good. In the most severe cases, when suffocation is threatened, tracheotomy by a veterinarian must be resorted to. When disease has assumed a chronic form use Davis Veterinary Blister to the throat. Repeat application if necessary.

Bronchitis is an inflammation of the membrane of the bronchial tubes. When a primary disease it comes from what is known as catching cold. It may also be secondary or complicated with other diseases of the respiratory system. Breathing irritating gases, and introduction of foreign substances into the bronchial tubes may also be the cause. It may be acute or chronic.

Symptoms.—Loss of appetite; elevation of temperature; generally to 104 or 105 degrees Fahrenheit. Inspiration is incomplete, short and painful. A characteristic, painful cough is present.

Treatment.—Place the animal in a light, well ventilated stall. Keep bowels in soft condition by enemas. Avoid violent purgatives. Keep body warm by blanketing. Let the feed be light and nutritious, adding Davis Stock Food, 2 tablespoonfuls to each feed. At beginning of disease give Bradbury's Brazilian Specific as directed; or, if this is not at hand, try giving three times daily a draft composed as follows: Extract of belladonna, 2 drams; solution of acetate of ammonium, 4 fluid ounces; water, $\frac{1}{2}$ pint. In the latter stages substitute with the following, given twice daily: Carbonate of ammonium, 3 drams; solution of hydrochlorate of strychnine, 2 fluid drams; spirits of nitrous ether, 1 fluid ounce; water, $\frac{1}{2}$ pint. Treat early before the disease becomes chronic.

Pleurisy is an inflammation of the serous membrane lining the chest cavity and enveloping the lungs. Is usually complicated with pneumonia; arises from exposure to cold or wet. Is occasionally caused by a penetrating wound.

Symptoms.—Great pain in the first stage; temperature ranges from 104 to 105 degrees Fahrenheit; pulse is small, quick, frequent and hard; respirations are abdominal, breath taken in short, jerky inspirations; emitted in long expirations; sharp, suppressed, painful cough; pressure on diseased part is painful, the animal flinching and giving a grunt; muzzle is dry and hot; mouth slimy and saliva scant. Symptoms increase in severity with advance of disease.

Treatment.—Same general care as recommended for bronchitis and pneumonia. In early stage give Bradbury's Brazilian Specific or some other good febrifuge to reduce the fever. For relief of cough give electuary formula given in treatment for laryngitis. Keep bowels relaxed and kidneys secreting freely. In the stage of effusion give the following three times a day: Digitalis tincture, 1 ounce; iodide of potassium, 30 to 60 grains; mix. In case of collapse of the lung, or when it is threatened, a surgical operation is sometimes necessary; this, however, must be performed by a veterinarian. Give good, wholesome feed, and Davis Stock Food, 2 tablespoonfuls to each feed.

Pneumonia is an inflammation of the lung substance, divided into three different forms; viz.: First, croupous; second, catarrhal; and, third, interstitial. Here, however, we shall treat the subject under the general heading of pneumonia, which answers our purpose—that of teaching the stock raiser how to diagnose the general disease, and how to treat it in its milder stages. The causes of pneumonia in general are the same as those of other inflammatory diseases of the respiratory tract.

Symptoms.—It is ushered in with a chill. This is followed with an elevation of temperature, usually 105 or 106 degrees Fahrenheit, or even higher. Respirations are quick and shallow; nostrils dilated; pulse full and hard; cough may or may not appear at this stage; nose is hot and dry; tongue sometimes protrudes and is slimy; coat staring; skin dry and harsh; the urine usually is diminished in quantity, highly colored, and bowels constipated. Animal stands with fore legs wide apart to facilitate respiration. In the second stage the temperature generally drops 1 or 2 degrees, and respiration is performed with much difficulty. Animal has a haggard appearance; the pulse becomes small and wiry at this period; the extremities are hot and cold alternately; the lung has assumed a characteristic, liver like appearance. In the third stage, if disease is to terminate favorably, cough becomes loose; animal improves; appetite returns and the symptoms described rapidly subside. If not progressing, the lung substance is broken down, is heavy, and will not sink in water. In fatal cases breath has a peculiar, fetid, cadaverous odor, is taken in short gasps, and horns, ears and extremities become cold and clammy.

Treatment.—Good hygienic surroundings, good nursing with wholesome, plain feed, adding Davis Stock Food to the ration, are essential in connection with the medical treatment. In early stages, when there is high fever, give Bradbury's Brazilian Specific or some other good febrifuge. Discontinue as soon as the fever abates. In a plethoric animal, with strong, bounding pulse, bleeding may be resorted to. If bowels are constipated, give calomel, 1 to 3 drams. In second stage diffusible stimulants are advised, viz.: Spirits of nitrous ether, 2½ ounces; spirits of aromatic ammonia, 1 ounce; mix and give in gruel three times a day. Davis Veterinary Liniment, or some other good liniment, a mustard plaster, turpentine, etc., may be applied externally as counter irritants.

DISEASES OF THE NERVOUS SYSTEM.

Encephalitis, or Staggers; means inflammation of the brain and its membranes. Owing to various symptoms, depending on the part affected, the disease is known by different names, such as staggers, stomach staggers, mad staggers, sleepy staggers, coma, frenzy, etc.

Causes.—Severe blows on the head with a hard object, or the head coming in violent contact with the ground or other hard substance in a fall; irritation caused by tumors in the brain; feed containing deleterious matters, for example, ergot and other fungi. When the disease is not caused by direct violence the quality of feed should be suspected.

Symptoms vary. Sometimes there may be frenzy at the start; generally, however, the animal is dull and sleepy; there is little inclination to move about; head may be pressed against wall or fence, legs kept moving, as though the animal were trying to walk through the obstruction. Body may be leaned against stall for support. Bowels are constipated; urine, when passed, small in quantity, darker in color than usual; trembling and spasms of muscles in different parts. In the dull stage animal may breathe less frequently than natural, each breath may be accompanied with snoring like sound. Pulse may be large and less frequent than normal. In all animals that have died from this disease the lungs after death were found to be very much congested.

When delirium ensues the animal is commonly said to be mad. She may bellow, stamp her feet, run about wildly, grate the teeth, froth at the mouth. If confined in a stable, she rears and plunges; body may be covered with perspiration; she may fall; muscles twitch and jerk; often head is raised and then dashed against the ground until blood issues from nose and mouth; eyes may become bloodshot.

and sightless; limbs stiff and outstretched, or they may be kicked about restlessly; head may be drawn back and tail drawn up; urine may be squirted out in spurts; often the washer is forced over the eye. When convulsions cease they may be followed by a period of quiet unconsciousness—coma. Then the animal may get on its feet and partake of feed, or it may arise with much difficulty and stagger blindly about the stall or field. These symptoms, of course, are not always seen together in the same case. The various symptoms, however, increase in frequency and intensity until ending in death.

Treatment.—Call a veterinarian at once. Treatment will be useless if not exceedingly prompt. In early stages pulse is large and usually will admit of bleeding. Have veterinarian take 8 or 9 quarts of blood from the jugular vein. Follow with a purgative, for a cow of average size, as follows: Epsom salts, 24 ounces; pulverized gamboge, $\frac{1}{2}$ ounce; warm water, 3 quarts; mix all together and give at once as a drench. Inject about 2 quarts of warm water or warm soap suds into the rectum with a syringe every three or four hours. Keep animal quiet. Give her all the cold water she will drink; withhold feed, except bran slops occasionally, adding Davis Stock Food, 2 tablespoonfuls to each feed; give feed in small quantities, or grass, if in season. Prevent animal from injuring herself during the convulsions; hold her head down to the ground, with straw under it; pour water continuously on the head; or bags filled with small pieces of ice may be applied to head. After the convulsions, or between them, a blistering compound, composed of mustard, 1 ounce; pulverized cantharides, $\frac{1}{2}$ ounce; hot water, 4 ounces; well mixed together, may be rubbed in over the loins, spine, back of the head and on each side of the neck. If the purgatives act and animal shows signs of improvement in the course of two or three days, 2 drams of iodide of potassium may be given every night and morning, dissolved in half a bucket of drinking water, if animal will drink, or may be dissolved in $\frac{1}{2}$ pint of water and given as a drench. Be extremely careful about the feed; let it be nutritious, but not coarse; feed at first in small quantities, gradually increasing as animal improves. Use Davis Stock Food throughout the treatment with the feed. After some progress to recovery has been made, $1\frac{1}{2}$ drams of pulverized nux vomica may be given twice a day, added to the iodide of potassium drench, administered as long as the staggering gait continues. Recovery, at best, is doubtful. In the rare cases that pull through, recovery, as a rule, is but partial, as generally a sequel, such as paralysis, remains. If this be the case, better fatten the animal for the butcher.

Apoplexy. The form of congestion of the brain known as parturient apoplexy is described elsewhere in this book. Cerebral apoplexy, not connected with parturition, is rare in cattle. If it occurs it is generally due to degeneration and consequent rupture of a blood vessel in the brain. The attack is sudden, the animal falling as if hit with an ax. Convulsions, as in staggers, may ensue, or there may be unconsciousness without movement; eyes are open and blindly staring; mouth frothy; body cold; breathing may be loud and snoring; pulse frequent and small. Death soon ensues. Plethoric cattle are most liable to attacks of what is known as congestive apoplexy, the congestion or superabundant quantity of blood in the vessels of the brain being followed with rupture of the vessels. It occurs usually in hot weather. Here bleeding should be resorted to immediately, and purgatives administered if possible. Cold applications to the head and the general treatment given for staggers, with Davis Stock Food added to a plain, wholesome diet, is required if the animal is to recover.

Concussion of the Brain is caused by severe blows on the head, striking the head against some hard object while running, falling on the head, etc. Bones may be fractured by the injury, causing compression of the brain.

Symptoms.—Depend on the severity of the injury. Animal may lie prostrate, entirely unconscious, but some slight convulsive movements remaining. Death may follow quickly, or if the injury is not serious, recovery takes place in a short time. Or there may be partial recovery, followed in a few days by encephalitis. If fracture of the bones of the cranium has resulted, trepanning may be necessary, and a veterinarian should be called. In emergency you may relieve compression of the brain by elevating the depressed bone with a thin but strong piece of steel. If the animal is not a very valuable one, better butcher it. In concussion of the brain, during the first stage, when surface of body is cold, cover body and legs with warm blankets. Apply cold water and crushed ice to head. Assist animal to its feed. When consciousness returns the purgative drench advised for encephalitis

should be administered. Keep animal in quiet place; feed small quantities of feed only, in the form of bran slops or grass, including 2 tablespoonfuls of Davis Stock Food to assist the digestion and assimilation, and as a tonic. Do not bleed. If case runs into encephalitis, treat according to directions given for this disease.

Epilepsy.

An affection characterized by the onset of sudden convulsions. Animal may appear in good health, but suddenly have an attack, stagger, fall, and violent convulsions ensue. Urine and dung may be voided involuntarily during the fit, breathing be stertorous, etc. Disease may be due to teething, worms or chronic indigestion.

Treatment.—If there are symptoms of worms or indigestion, give treatment as advised for these diseases. If due to irritation from teething inflamed gums must be lanced. Examination of the mouth may develop the fact that one of the temporary teeth causes irritation by remaining unshed; if so, this tooth must be extracted, so as to leave room for the growth of the permanent tooth. If the cause cannot be discovered there is not much hope of treating epilepsy successfully. Careful diet, using Davis Stock Food regularly, 1 tablespoonful to each feed in health, and 2 tablespoonfuls to each feed in disease, will, however, do much to prevent these fits.

Sunstroke,

or Prostration from Heat, is a condition brought about by extreme heat of the summer months.

Symptoms.—Early signs are those of exhaustion, dullness, panting, frothing, tongue hanging out, irregular gait, uneasiness, palpitation. If condition is not mitigated in a little while, animal will stagger, fall, struggle for a while, then gradually become quiet, or struggles may continue with fruitless attempts to regain standing position. Serious attacks may be very sudden, unconsciousness occurring at once.

Treatment.—At first, when not serious, remove to quiet, sheltered place, reduce diet for a few days, give Davis Stock Food with the ration, and recovery will take place. When animal has fallen apply cold water to the head; rub body and limbs with wisps of straw, continuing for a considerable time. If power of swallowing is not lost (which may be ascertained by pouring a little cold water into the mouth) give 3 drams of liquor of ammonia fort., diluted with a quart of water. Be careful in drenching the animal when lying down. Repeat drench in half an hour. If patient is unconscious and drench cannot be given, same quantity of ammonia and water may be injected with a syringe into the rectum. When ammonia cannot be obtained quickly, 20 drops of oil of turpentine, shaken with 1 pint of milk, may be injected into rectum. Take animal to shelter as soon as it is able to rise; assist it to its feet; let the diet be light for several days, with Davis Stock Food always added. Give the patient all the cold water it will drink. When signs of returning strength appear, 12 ounces of Epsom salts, dissolved in 1 quart of warm water, may be given in those cases which have been down and unconscious.

Injuries to the Spinal Cord.

The spinal cord is liable to concussion from blows and falls, and paralysis, more or less, may be the result. If the fracture produced is above the middle of the neck, it will cause death. As a matter of course, when the back is broken, there is no remedy; bleed the animal to death, and convert it into meat at once. The animal not being able to rise after the accident, together with the fact that sensation is lost, as evidenced by sticking a pin into the paralyzed parts, should decide the question.

Paralysis,

or loss of motion in a part, may be due to a lesion of the brain, of the spinal cord, or of the nerve. It may also be caused by reflex irritation. As has already been pointed out, it may likewise be caused by concussion of the spine; fracture of a bone of the spinal column; concussion of the brain; compression of the brain. Paralysis affecting both sides of the body is technically called paraplegia; when only one side of the body is affected the term hemiplegia is used to indicate this condition.

Causes.—Paraplegia may be traced to moldy feed. Cows heavy with calf are sometimes affected with a form of paraplegia, usually attacking them from about a month to a few days before calving. As a rule, the animal recovers after calving, and requires only general care, good bedding, regular diet, with a tonic and digestive as Davis Stock Food added. Cows after calving are occasionally attacked with a form of paralysis not associated with parturient paralysis. Inflammation of the womb may be the cause, or injuries to the nerves while calving.

Treatment.—For parturient and ordinary paralysis, both paraplegia and hemiplegia, simple treatment, such as enemas of warm soap suds, 2 quarts injected into the rectum in case of constipation, should be administered; if this is not sufficient to keep bowels moving, $\frac{1}{2}$ pound of Epsom salts dissolved in 1 quart of warm water should be given as a drench. If paralysis continues after calf is born give the cow a purgative—1 pound of Epsom salts dissolved in 1 quart of warm water; also 1 cupful of Davis Stock Food every night and morning in the feed, if she will eat it, or with some water as a drench. The blistering compound recommended in the treatment of encephalitis may be rubbed well over the loins. If you are treating for the form of paralysis associated with indigestion or impaction of the rumen (paunch) use the same remedies, but let the treatment be more drastic, especially the purgative. Always give 2 tablespoonfuls of Davis Stock Food to each feed, and you will find that the digestive and assimilative powers will soon recuperate and the paralysis gradually disappear. If a cow will persist in lying down while suffering from this disease, and not even her inveterate enemy, the dog, can succeed in arousing her, there at times is no other remedy but to butcher her. But these instances are rare.

Tetanus, or Lockjaw, may affect cattle, but it is a rare disease among them. It consists in a continued spasm of the voluntary muscles. By turning to the chapter on horses, the reader will find a pretty complete description of this disease and its cause and cure. Among horses and mules it is quite common. The cause of tetanus is not at all times clearly demonstrated and defined, all authorities, however, agreeing upon one point, namely, that it is most frequently met with in connection with a wound of some sort and at such times is caused by a germ—*Bacillus tetani*. It is not only large, prominent wounds, nor a very painful wound alone that are apt to be followed by tetanus; but, in fact, it is often associated with a wound of the most trivial character. And a wound in any part of the body may be followed by tetanus. It may ensue a few days after the infliction of the wound, but the rule is one and two weeks after and when the wound, as a rule, has healed. Operations, as well as accidental wounds, may be followed by tetanus. Castration very often produces it. Uncleanliness of the instruments or hands of the operator undoubtedly are to blame in such instances. With a good antiseptic wash, such as Phenalin, at hand, and scrupulous cleanliness observed on all points, the danger is greatly minimized. Although the wound has much to do with the cause of tetanus, no expert holds that it in itself can produce it. Something of a specific nature—the germ—must gain access to the wound to develop the disease, it is asserted. The evidence proves that the disease in both man and animal is the same. Be careful, therefore, in ministering to an animal suffering from this terrible and deadly affection.

Symptoms.—Contraction or spasms of the muscles. General sensitiveness; the afflicted beast is ever on the alert, startled by the slightest noise; first symptoms noticed generally is some stiffness in the manner of carrying the head; muzzle is elevated; ears stiff; the washer is forced over the eye from the inner corner; animal moves stiffly about; legs are almost rigid; when walking they are used like sticks; when turning the body is kept straight, moving around like a log; tail is elevated and stands out like a pump handle; animal will eat as long as it is possible to open the jaws wide enough to take anything into the mouth. Pulse usually hard, but does not vary very much from the normal in other respects. As disease progresses symptoms become more marked. Animal usually remains on its feet as long as possible; should it go down after the disease is well developed it is rarely able to rise alone, and in trying to do so, struggles convulsively, the struggles generally ending in death.

Treatment.—Tetanus, although always extremely serious, is not always a fatal disease. To begin treatment as early as possible is of supreme importance if a cure is to be effected. At appearance of first symptoms when animal can still swallow, give the following drench: Epsom salts, 10 ounces; common salt, 10 ounces; calomel, 2 drams; pulverized gentian, 1 ounce; warm water, 2 quarts. After administration of this, do not drench any more. Examine for wounds; look between the claws, search over the body and legs, even examine the mouth. Place animal in darkened, quiet stall, and thoroughly wash out all wounds, large or small, with a solution of warm water and Phenalin, or hot soap suds. Then use the following: Bichloride of mercury, 30 grains; pure carbolic acid, 1 ounce; water, 1 quart; mix. Pour some of this solution on the wound, and with a clean piece of cotton or muslin rub the medicine into all parts of the wounds; be sure that it comes in contact with every portion of them, literally scour

every bruise or scratch, but do no unnecessary injury. Then make soaking wet some absorbent cotton and bind it well on the wound. Once a day change this dressing. Painful wounds on the feet should be poulticed twice a day with linseed meal for three or four days; each time poultice is changed wound should be washed with the medicine. When poultices are no longer necessary continue to dress the wound with the absorbent cotton and medicine once a day. Give animal all the cold water it will drink. As swallowing is very difficult, feed slops made with bran, corn meal, small quantities of linseed meal, with Davis Stock Food added. Dissolve 1 ounce of bromide of potassium in every 2 gallons of water the animal can be induced to drink. It is not advisable to put cattle in sling, but it may be necessary to have the animal in a stall where it may be supported in canvas. When it lies down it is very difficult to raise it. Do not suspend it in the sling—just support. If disease is not recognized before power of swallowing is gone, there is little to be accomplished by treatment.

Diuresis, Polyuria, Diabetes Insipidus,

or, in simpler language, excessive secretion of urine, is a disease occurring frequently in cattle fed on distillery swill, caused by the great consumption of liquid feed. The condition, in spite of the fattening influence of the feed, is unwholesome. Diuresis also may occur from increase of blood pressure in the kidneys, diseases of the heart and lungs, the eating of digitalis, English broom, contraction of the blood vessels on the surface of the body in cold weather, etc. Also from acrid or diuretic plants, from excess of sugar in the feed, frozen feed, molds in the feed, alkaline waters, etc. The condition in some of these cases may be beneficial instead of vice versa. But in other cases the health and condition suffer and inflammation of the kidneys may occur. Treatment consists in a change of diet to more solid aliment. Boiled flaxseed added to wholesome dry feed, each feed containing 1 tablespoonful of Davis Stock Food, is recommended. In serious cases give a dose of 2 drams each of sulphate of iron and iodide of potassium twice a day. In obstinate cases, 2 drams of ergot of rye may be added.

Bloody Urine, Red Water, Wood Ill,

is a common disease among cattle, especially on low, damp, undrained lands. The bloody urine is the more direct result of structural disease of the kidneys or urinary passages (inflammation, stone, gravel, tumors, kidney worms, sprains of the loins, etc.) Among the causes producing it may be mentioned water from soils rich in decomposing vegetable matter, and containing alkaline salts, and the presence in the water of bacteria growth; hence the prevalence of red water in marshy districts and on clayey soils.

Treatment.—In the milder forms of red water a smart purgative (1 pound to 1½ pounds of Glauber salts) will clear away the irritants from the bowels and allay the fever. If, then, wholesome feed, boiled flaxseed, bran, etc., to which Davis Stock Food is added, are fed, the trouble will generally take care of itself. If much blood is lost, double doses of Davis Stock Food should be continued for some time. For cases in which an excess of diuretic plants has been taken, it may be well to replace the salts by 1 to 2 pints of olive oil, adding 1 ounce of laudanum and 2 drams of gum camphor. Also to apply fomentations or a fresh sheepskin over the loins. In all cases use Davis Stock Food and a tonic, stimulating diet, the different grains (oats, barley, wheat, bran, rye) and seeds (rape, linseed, cotton seed) being especially called for. In case of fever use Bradbury's Brazilian Specific.

Albumen in the Urine,

or Albuminuria, is always present in bloody urine. Among the causes are (1) excess of albumen in the blood; (2) blood pressure; sudden suppression of milk; (3) after cutting (or disease) of the motor nerves going to the kidneys, causing congestion of these organs; (4) violent exertion in any form; (5) in most fevers and inflammations of important organs; (6) in burns and congested states of the skin; (7) under the action of poisons, etc. It can also be produced experimentally by puncturing the back part of the base of the brain. In abscesses, tumor, or inflammation of the bladder, ureter or urethra, the urine is albuminous.

Treatment.—Direct, as a rule, to the disease on which it is dependent. If no other recognizable disease exists use mucilaginous drinks of boiled flaxseed, slippery elm or gum; tannic acid, ½ dram twice daily, and fomentations, or even mustard poultices over the loins. In chronic cases without fever:

Tonics (Davis Stock Food with the feed ration), hydrochloric acid, 6 drops in 1 pint of water; phosphate of iron, 2 drams, or sulphate of quinia, 2 drams, twice daily. Keep patient carefully from cold and wet, and allow a good, nutritious ration, adding Davis Stock Food in the proportion prescribed.

Inflammation of the Kidneys,

or Nephritis, is attributed to the same causes as those producing bloody urine, such as irritant and diuretic plants, Spanish flies applied as a blister or otherwise, exposure to cold and wet, the presence of stone and gravel in the kidneys, injuries to the back or loins, as by riding each other, drinking of alkaline water or putrid, stagnant water, containing bacteria, consumption of musty fodder, etc.

Symptoms.—In severe cases there are colicky pains in a violent form; animal frequently shifts from one foot to another; stamps, kicks at its belly, looks anxiously at its flank at frequent intervals, moans plaintively, lies down and quickly gets up again, grinds its teeth, whisks its tail, keeps the back habitually arched and rigid, etc. Bowels may be costive, feces glistening with a coat of mucus, or may be loose and irritable, paunch and even bowels may be distended with gas (bloating). In some animals, male and female, the rigid arched condition of the back will give way to such undulating movements as are sometimes seen in the act of coition.

Treatment.—Remove acrid or diuretic plants from the feed; purge and clean out stomach and bowels by a moderate dose of castor or olive oil; treat sprains of back and loins with soothing fomentations or poultices, or by fresh sheepskin with the fleshy side applied; keep patient in narrow stall in which it cannot turn even its head. Apply warm blanketing. Check fever by the use of Bradbury's Brazilian Specific or by 15 drops of tincture of aconite, given every four hours. If pain is acute, relieve by giving 1 ounce of laudanum or 2 drams of solid extract of belladonna. When the severity of the disease has passed, use tonics (quinia, 2 drams, or gentian powder, 2 drams, daily). Diuretics, too, may be cautiously given at this advanced stage (oil of turpentine, 2 teaspoonfuls; bicarbonate of soda, 1 teaspoonful, repeated twice a day). This will relieve dropsy and give tone to the kidneys and general system. Pure water is essential but should not be given when chilled; warm drinks are preferable. In the chronic form of kidney inflammation the same protection against cold and similar general treatment are demanded. Tonics are important to improve the general health, and Davis Stock Food, added to a wholesome, nutritious ration, will prove of the utmost value in building up the debilitated system. By correcting the digestive and assimilative functions and stimulating the appetite and circulation, it will save many a valuable animal if given regularly. The above medication may be dispensed with if Davis Stock Food is at hand, for it in itself will usually effect a cure.

Parasites of the Kidneys.

Of the larger parasites attacking the kidneys may especially be mentioned the cystic form of the echinococcus tapeworm of the dog, the cystic form of the unarmed or beef tapeworm of man, the dividing bladder worm. These give rise to general symptoms of kidney disease.

Retention of Urine.

Inability to pass urine may come from three conditions: (1) spasm of the neck of the bladder; (2) paralysis of the body of the bladder; (3) obstruction of the channel of outlet by a stone (calculus).

Causes.—Lodgment of small stones or gravel; feeding on irritant diuretics; enforced retention of urine while at work or during painful or difficult parturition; extensive application of Spanish flies to the skin; indigestion; spasms of the bowels, etc.

Treatment should be made to conform to the cause. In indigestion, get rid of the irritant contents of the bowels by laxatives, injections of warm water, etc. Wash Spanish fly blisters from the surface; relieve spasms by injecting ½ ounce of solid extract of belladonna in water into rectum, or by solution of tobacco. Fomentations of warm water may be made over the loins and between thighs; insert oiled hand in rectum and press moderately on anterior part of the bladder. All other measures failing, the liquid must be drawn off through a tube (catheter). This, however, can only be done by a veterinarian. After relief has been obtained the administration of belladonna, 2-dram doses daily for several days, is recommended. Let the diet be nutritious and wholesome, and keep the circulation and digestive organs in good order by the use of Davis Stock Food; then you will rarely find any of your cattle suffering in this way.

Urinary and Renal Calculi,

or stone or gravel in the urine and kidneys, consists of hard bodies, mainly made up of the solid earthy constituents of the urine which have crystallized and remained in the urinary passage or kidneys. Calculus in cattle is essentially a disease of winter, and of such cattle as are denied succulent feed, confined to dry fodder as their exclusive ration. In this connection it should be noted that a great drain of water from the system, by any other channel than the kidneys, predisposes to the production of gravel or stone. There are a good many different names for the different phenomena or conditions under which this affection presents itself, but for our purpose, that of teaching the progressive stockman how to recognize and overcome, or better, prevent the trouble from occurring, it is not necessary to enlarge upon these. Suffice to say that when the obstruction, stone or gravel, is located in the kidney, it is called renal calculi. In an animal leading a quiet, uneventful life, such as the ox, stones of large size may be present in the kidney without producing any disorder. In cattle fattened on dry feed in winter, or on magnesia limestone, it is exceptional to find the substance of the kidney free from calculi about the size of a grain of wheat or less.

Treatment, both in the case of ureteral and renal calculi, is not very successful, as only the smallest calculi can pass through the ureter and enter the bladder, and even if they should do so they are liable to a progressive increase there, so that later they may cause the symptom of stone in the bladder. Treatment, therefore, should largely be preventive, feeding properly and always keeping the digestion and circulation in good working order by the use of Davis Stock Food with the regular ration. If this is done the disease will rarely develop. If, however, the disease be present and treatment demanded, it should be primarily soothing and anti-spasmodic. Fomentations with warm water over the loins should be persisted in without intermission until relief has been secured. Large doses of laudanum (2 ounces), or of solid extract of belladonna (2 drams), will not only soothe the pain but relax the spasm and favor the onward passage of the calculus. Encourage animal to drink large quantities of cold water, to favor the free secretion of very watery urine; this will both serve to obviate irritation and press the stone forward to the bladder. In certain cases it will tend to disintegrate it. A succulent diet, gruel, sloppy mashes, turnips, beets, potatoes, apples, pumpkins, ensilage, succulent grasses, always adding Davis Stock Food to the ration (2 tablespoonfuls to each feed in disease, and 1 tablespoonful in health), with plenty of cold, fresh water, will do much to prevent and relieve milder forms of stone and gravel.

The treatment of stone in the bladder or urethra consists of the removal of the stone by incision and the use of forceps, and must be done by a veterinarian who will give the necessary directions for after-treatment better than can be done here.

DISEASES OF THE URINARY ORGANS.

Excess of Venereal Desire — Satyriasis in Male, Nymphomania in Female. Too frequent sexual intercourse in the male may be the cause; also injury and congestion of the base of the brain; congestion or inflammation of the testicles or mucous membrane covering the penis. Symptoms are frequent or constant erections, attempts at sexual connection, and sometimes discharge of semen without connection. Loss of flesh, emaciation and physical weakness may be the result. In the female the morbid desire is still more noticeable and injurious. Highly nitrogenous feed, stimulating the blood in cows, especially when they have no free exercise in the fields, and are subject to constant association with a vigorous young bull, may excite it until it becomes a disease. Disease of the ovaries, however, is preeminently the cause. Tumors and cancers of the womb, rigid closure of the neck of the womb, so that conception cannot occur, and the too frequent services of the male stimulate the unsatisfied appetite, and a purulent discharge from the womb and vagina also are factors. The treatment in each case should vary with the cause. Stop overfeeding on highly nitrogenous feeds, allow the stock to exercise in the open fields, have diseased ovaries removed; tumors of the womb may also often be detached and extracted, although a veterinarian

of course, will be required for these operations. Let the ration be plain and wholesome and keep the digestion and assimilation normal and healthy by the regular use of Davis Stock Food with the feeds.

Diminution or Loss of Venereal Desire will occur in either sex from low condition and ill health. Chronic, organic diseases, emaciation, weakness, prolonged semistarvation in winter, etc., may cause it. Degeneration of the secretive organs (testicles, ovaries) of the male and female respectively, are predominant factors. The old, fat, lazy bull becomes sluggish and unreliable in serving, not due to his weight and clumsiness alone, but largely to fatty degeneration of the testicles and their excretory ducts. Similarly the overfed, inactive cow, above all the show cow, fails to come in heat at the usual intervals, shows little disposition to take the bull, and fails to conceive when served. Her trouble is the same in kind, namely, fatty degeneration of the ovaries. The true preventive of such conditions is to be found in sound hygiene. Let the breeding animal be of adult age, neither over nor underfed, digestion and circulation healthy and normal by the use of Davis Stock Food with the regular ration, vigorous in health. In bull and cow which are becoming unduly fat and showing indications of sexual indifference the treatment must be active. Turning out on short pasture where it must work hard for a living will often suffice. If the bull cannot be turned out, he may sometimes be used in the yoke or tread power, or kept part of his time in a field or paddock chained by a ring in his nose to a strong wire extending from side to side of the lot, attached securely to two trees or posts. The wire should be higher than the back of the bull, which will move from end to end at frequent intervals. In case of rigid closure of the mouth of the womb in the female, dilatation, performed by a skilled veterinarian, is the only remedy.

A number of other causes will produce sterility in cattle. Among these are: Breeding at too early an age, causing small, stunted growth; the immature bull put to too many cows; highly fed, plethoric females occasionally seem to escape conception by the very intensity of the generative ardor; feeding on a very saccharine diet, favoring the deposition of fat; abortion caused by ergoted grasses; smutty wheat or corn, laxative or diuretic drinking water; improper musty feeds that cause colic, indigestion and disease of the urinary organs, notably gravel; irritants of the bowels or kidneys may all contribute to barrenness. Hermaphrodites, so called, whose organs are not distinctively either male or female, of course are barren. Bulls with both testicles retained within the abdomen may go through the form of serving a cow, but the service is unfruitful. A bull or cow that has been too closely inbred in the same line for generations, may be unable to generate together, but be prolific when coupled with animals of other strains of blood.

Congestion and Inflammation of the Testicles,

or Orchitis, may result from blows or other direct injuries, excessive service, or formation of some new growth (tumor) in the glandular tissue. It may be treated by rest, 1½ pounds of Epsom salts given in 4 quarts of water, restricted diet on some succulent feed, adding Davis Stock Food to the ration. Pain may be allayed by a smearing with a solution of opium or extract of belladonna.

Should a soft point appear, indicating the formation of matter, it may be opened with a sharp lancet and the wound treated daily with a solution of 1 teaspoonful of carbolic acid in a pint of water. In severe cases the gland is ruined for procreative purposes and must be cut out.

Inflammation of the Sheath

may occur in bulls from infection during copulation, and from bruises, blows, etc. Is most common in the ox in connection with comparative inactivity of the parts. The treatment will depend on the stage of the disease. If recent and in no instant danger of rupture of the bladder, the sheath should be cut open in the median

line below, and the sac emptied out with the finger or a spoon, after which it should be thoroughly washed with tepid water. Then a catheter or small rubber tube should be inserted. This, however, requires the service of a veterinarian who will give further directions. If the bladder is ruptured the case is hopeless.

Inflammation of the Urethra,

or Gonorrhoea, may infect the bull like other males. If recognized before the discharge sets in, a dose of 1½ pounds of Epsom salts, and local warm fomentations would be appropriate. After the onset of the whitish discharge a daily injection into the penis of a solution of 20 grains of permanganate of potash

in 1 pint of water will be beneficial.

Ulcers on the Penis

of the bull may result from gravel or sebaceous masses in the sheath, or from having served a cow with leucorrhœa. Treat by frequent injections into the sheath of a lotion made with 1 dram sugar of lead, 60 drops carbolic acid and 1 quart water.

Polypus of the Vagina or Uterus

is a tumor growing from the mucous membrane, and often connected to it by a narrow neck. Growing in the vagina it may project as a reddish, rounded tumor from the vulva, especially during the act of passing water. It can be distinguished from descent of the womb by the absence of the orifice of that cavity, which may be felt by the oiled hand beyond the tumor in the depth of the vagina. In the womb a polypus is less easily recognized. At the time of calving it may be felt through the open mouth of the womb, and recognized by the experienced touch (it must be carefully distinguished from the mushroom formed cotyledons, to which in ruminants the fetal membranes are attached). Often the polypus can only be detected by examining the womb with the oiled hand introduced through the rectum. Polypi may cause a mucopurulent discharge, or they may only be suspected when they prove an obstacle to parturition. The best way to remove them is to put the chain of an ecraseur around the neck or pedicel of the tumor and tear it through; or the narrow neck may be torn through by the emasculator; or, in an emergency, it may be twisted through by rotating the tumor on its own axis. The removal of the tumor will allow calving to proceed, after which the sore may be treated by a daily injection of $\frac{1}{2}$ dram sulphate of zinc, 1 dram of Phenalin, and 1 quart of milk warm water.

Signs of Pregnancy. If cow remains for three or four weeks after service without showing signs of heat (bulling) she is probably pregnant. A few exceptions may exist, but that is the rule. The bull, no matter how ardent his sexual instinct, cannot be made to pay any attention to a cow not in heat. When she has conceived, the cow usually becomes more quiet and docile, lays on flesh and fat more rapidly, especially during the first four months of gestation. The enlargement of the abdomen, and its dropping so that it bulges below and to each side, while it falls in at the flank between the outer angle of the hip bone and last rib, are significant features which usually mark pregnancy. In the early stages of pregnancy the udder develops slowly; toward the end more rapidly. After the fifth month the movements of the calf may often be observed in the right flank when the cow is drinking cold water. Another method of examination is through the flank, by touch. The palm of the hand is pressed strongly inward about 8 inches in front of the stifle and a little below several times in succession, and is then brought to rest with the pressure maintained. Presently there are felt distinct characteristic movements of the fetus, which has been disturbed and roused to action. Of all the modes of examination by touch, that done through the rectum gives the earliest satisfactory indications. The hand and arm well oiled are inserted, and the excrement having been removed, if necessary, the palm of the hand is turned downward and the floor of the pelvis carefully examined. There will be felt in the median line the pear shaped outline of the bladder, more or less full, rounded or tense, according to the quantity of urine it contains. Between this and the hand will be felt a soft, somewhat rounded tubular body—the womb, inside which the head, limbs and body of the fetus may be distinctly made out. Still another sign is the beating of the fetal heart, which may be heard in the latter half of pregnancy when the ear is pressed on the flank in front of the right stifle, or from that downward to the udder. The average duration of pregnancy in the cow is 285 days.

Hygiene of the Pregnant Cow.

The pregnant cow should have exercise, and as regards both her exercise and feed, nothing is better than a run on a smooth pasture. Keep her quiet, do not scare her, nor permit anybody else to do so; do not let her ride nor be ridden by other cows; driven rapidly through narrow gateways, caused to jump ditches or fences, etc. Let the diet be good, not a kind to fatten, but with a liberal supply of nitrogenous constituents. Aliments rich in lime and phosphates, like wheat, bran, middlings, etc., can be used to advantage, especially when 1 tablespoonful of Davis Stock Food is added to each feed. In the period of pregnancy it is especially important to keep the digestion and circulation unimpaired, and no better agent in the world exists to further this end than Davis Stock Food. In the case of plethoric and heavy milking cows of mature age, the hitherto liberal diet must be changed at the last week for the scantiest possible fare, and the bowels must be kept open by laxatives, if need be, if the owner would avoid milk

fever. Keep the cow as much as possible confined to the breed or herd to which she belongs, and do not allow her to mingle freely with strange cattle. Remember that you must avoid strong purgatives and diuretics, unless in the very last days of gestation in very plethoric cows. When Davis Stock Food is used regularly throughout the period of gestation such remedies even then need rarely be resorted to.

Protrusion of the Vagina

is common during pregnancy, and may sometimes be remedied by raising the hind part of the stall higher than the front part. Or a truss may be applied, as for eversion of the womb, and worn until the period of calving approaches. Hernia (breach) of the uterus also often occurs in advanced pregnancy, the womb in some cases escaping through a great laceration of the abdominal muscles to one side of the udder, the hernial mass extending down to one side of that organ. However unsightly, this often allows the cow to complete its pregnancy naturally, and a broad, supporting bandage placed around the abdomen is all that can be recommended. After calving, you had better fatten the animal.

Cramps of the hind legs may be caused, the compression by the womb and fetus of the nerves passing through the pelvis being the cause. It disappears under friction and motion and is never seen after calving. In the latter months of pregnancy the hind legs may swell beneath the hocks, or a soft swelling, which pits on pressure with the finger, appears from the vulva down between the thighs to the udder and in front. It is mainly due to the pressure of the enlarged womb on the blood vessels, is not dangerous, and disappears after calving.

Dropsy of the Membranes of the Fetus — Dropsy of the Womb.

its tense wall adjacent.

The pregnant womb is liable to become overdistended by an excess of fluid in the inner water bag in which the fetus floats. It draws on the cow's system, overtaxes her strength and deranges her digestion, so that the result may prove fatal to both mother and offspring. On the other hand, even the worst cases may right themselves without help. The best remedy is to draw a portion of the fluid through a hollow needle passed through the neck of the womb or through

Paralysis of the Hind Parts

may occur in ill fed, unthrifty and weak cows during the last weeks of pregnancy. Something may be done for these cases by a warm, dry bed, an abundant diet fed warm, with Davis Stock Food added to each feed (2 tablespoonfuls), frictions with straw wisps or with Davis Veterinary Liniment (if this is not at hand use equal parts of oil of turpentine and sweet oil on the loins, croup and limbs). The case becomes increasingly hopeful after calving, though some days may still pass before the animal can support herself upon her limbs.

Extra-Uterine Gestation, Fetus Developing Outside the Womb.

Such cases are rare and usually divided into three types: (1) that in which the fetus is formed in or on ovary (ovarian gestation); (2) that in which it is lodged in the fallopian tube or canal between the ovary and womb (tubal gestation); and (3) that in which it is lodged in the abdominal cavity and attached to one or more of its contents from which it draws its nourishment (abdominal gestation). The symptoms are those of pregnancy, which may be suddenly complicated by inflammation (peritonitis), owing to rupture of the sac containing the fetus; or at full term signs of calving appear, but no progress is made, and examination with the oiled hand in the vagina or rectum finds the womb empty and the mouth closed. Further examination will disclose the fetal sac attached in some part of the abdominal cavity. Little can be done in such cases except to quiet pain and excitement by anodynes (opium, chloral, etc.) and leave the rest to nature.

Prolonged Retention of the Fetus.

Even when fully developed within the womb, the fetus may fail to be delivered at the proper time; labor pains having quickly subsided, and the cow resumed her usual health. In such cases the calf dies and its soft parts are gradually liquified and absorbed, while the bones remain for years in the womb enclosed in the remains of the fetal membranes. Or they may be expelled at any time. If remaining, they prevent conception.

If the true condition is recognized at the time of labor pains, or rather the subsidence of these, the mouth of the womb may be dilated by the fingers, by the insertion of sponge tents, or by a mechanical

dilator, the fetal membranes may be ruptured and the calf extracted. After the removal of the calf and its membranes the danger of putrid poisoning may be obviated by injection of antiseptic solutions, such as Phenalin and water. Or an antiseptic may be made by a solution of 10 grains of bichloride of mercury in 1 quart of water.

Abortion—Slinking of the Calf.

Abortion properly means too early birth, or expulsion before the offspring is able to live out of the womb. If expelled after it is capable of independent existence it is premature parturition. In the cow this may be after seven and one-half months of pregnancy. Dairymen use the term abortion for the expulsion of the product of conception any time before the completion of pregnancy, and we will use it here in the same manner. Abortion in cows is either contagious or non-contagious.

Non-Contagious Abortion.

Abortion most often occurs at those three weeks' intervals at which the cow would have been in heat if non-pregnant. Poor condition, weakness, too watery a state of the blood are often predisposing causes, and this again may be caused by poor or insufficient feed, excessive drain upon the udder while bearing the calf, use of deficient, unsuitable feeds, chronic wasting diseases, round or tapeworms in the bowels, flat worms in the liver, other worms in the liver and lungs, dark, damp, ill ventilated buildings, etc. The nourishment may be so poor that the fetus dies in the womb and is expelled in consequence. Davis Stock Food should always be added to a wholesome, nutritious ration during the period of gestation in order to guard against this. Other causes of abortion are excessive loss of blood, chronic diseases of the abdominal organs, fatty degeneration of the heart, especially in old cows; indigestions of all kinds; putrid, stagnant water; the smut of maize, wheat, barley and oats; rust; the riding of one another by cows; keeping in stables that slope too much behind; deep gutters behind the stalls into which one or both feet slip unexpectedly; the excitement, jarring and jolting of a railroad journey; irritant poisons; and abortion may also result from the death of the fetus, the slipping of a young fetus through a loop in the naval string so as to tie a knot which will tighten later and interrupt the flow of blood; and there are a number of diseases of the mucous membranes of the womb, fatty or other degeneration, etc., which interfere with the supply of blood to the fetus or change its quality so that death is the natural result, followed by abortion.

Contagious Abortion.

Although the symptoms may appear the same, this is really the only channel through which abortion can be carried from herd to herd. It has even been found that the virus of aborting cows may cause abortions in the sow, ewe, goat, rabbit, and guinea pig, and that it has been intensified by passing through either of the two last named animals; it will affect also the mare, bitch, cat. Too much care to isolate animals infected in this way cannot therefore be exercised. The precise germ or germs causing abortion have not as yet been demonstrated beyond question.

Symptoms of Abortion.—In the first two or three months of pregnancy no symptoms may be observed, and unless the aborted product is seen the fact of abortion may escape notice. Some soiling of the tail with mucus, blood, and the waters may be noticed, or the udder may show extra firmness, and in the virgin heifer or dry cow the presence of a few drops of milk may be suggestive, or the fetus and its membranes may be found in the gutter or elsewhere as a mere clot of blood. In advanced pregnancy abortion is largely the counterpart of parturition, so that especial description is superfluous. The important thing is to distinguish the early symptoms from those of other diseases, so that the tendency may be arrested and the animal carried to full time if possible. The cow is dull, sluggish, separates herself from the herd, chewing the cud languidly, or there may be frequent lying down and rising, uneasy movements of the hind feet or tail, etc. The thing is not to confound it with urinary or digestive disorder, but in a pregnant cow to examine at once for increase of mucus in the vagina, or for blood or liquid there or on the root of the tail; enlargement, firmness or tenderness in the udder, and above all, for any slight straining, suggestive of labor pains.

Prevention.—Generous feeding, Davis Stock Food, the right kind of feed (wheat, bran, rape cake, cotton seed, oats, barley, beans, peas, etc.), rich in earthy salts, will correct bloodlessness and weakness. Always add Davis Stock Food (2 tablespoonfuls to each feed to the ration of pregnant cows). This more than any other agent will insure against loss by abortion. Avoid infested pastures, ponds,

streams, shallow wells, etc., in order to guard against worms. Take the utmost care, sanitary and hygienic, in carrying your cow through the gestation period. Disinfect the stable and stall with solutions of Phenalin and water.

Treatment of Contagious Abortion.—If treated promptly abortion may be prevented even though the first symptoms have appeared. Place cow in a quiet stall alone, and administer agents to check the labor pains. Laudanum in doses of 1 ounce for a small cow and 2 ounces for a large one should be promptly administered, and repeated in three or four hours should the labor pains recur. Keep up for days or weeks if necessary. Free use of germicides and disinfectants are especially valuable in the treatment of contagious abortion. Keep the stable scrupulously clean throughout. Scrape or wash back part of stall and gutter and water it with a solution of Phenalin; if this is not at hand, with a solution of 5 ounces sulphate of copper (bluestone) in 1 gallon pure water. Repeat cleansing once a week at least. If possible, treat the whole stable in the same way, as it is impossible to say how many cows may have become infected and harbor the germ. Dissolve 1 dram corrosive sublimate, 1 ounce of alcohol and 1 ounce of glycerine; shake up in a gallon of water and use as vaginal injection and wash for the parts about the vulva and root of the tail. (Be careful about this wash, as it is very poisonous, both to man and beast.) Every morning the vulva, anus, back of the hips, and root of the tail should be sponged with this liquid, and you had better apply it to the whole herd. When a case of abortion has occurred the fetal membranes must be removed by the hand without delay, and, together with the fetus, destroyed by burning or boiling, or buried deeply. Then cleanse and water stable with Phenalin or the copper solution. Then wash out womb with $1\frac{1}{2}$ gallons of the corrosive sublimate solution, injected through a rubber tube to the depth of the womb and with a funnel in its outer elevated end. Repeat daily for a week. One injection of the same kind should be given into the vagina of the other cows in the herd, after which only wash their external parts and tails with the solution daily. A certain number of cows will harbor the germ in the womb when treatment is started and it is therefore not to be expected that abortions will cease at once, but keeping up the treatment you may get rid of the trouble the following year. As an aborting cow is generally of little use for the dairy, you had better separate and fatten her. Once more, remember that the main things are scrupulous cleanliness, hygiene, sanitation, disinfection, combined with proper feed in the successful prevention and treatment of this troublesome malady.

General Maxims for the Assistant in Difficult Parturition

Do not interfere too soon. "Meddlesome midwifery is bad" with animals as with women. When assistance is necessary the operator should dress in a thick flannel shirt from which the sleeves have been cut off clear up to the shoulders. Before inserting the hand smear arm with oil, lard or vaseline, care being taken that the oil or lard is fresh, neither salty nor rancid, and that it has been purified by boiling, or rendered antiseptic by the addition of Phenalin, or 1 teaspoonful of carbolic acid to the pound. The presenting limb or head should then be secured by a rope with a running noose, so that it may not slip back into the womb. Turn the head of the cow down hill. If the cow is lying down turn her on the side opposite that on which the limb is missing so that there may be more room for bringing the latter up. Even if the missing limb is reached it is vain to attempt to bring it up during labor pains. When pain has ceased attempt to straighten out the limb before the next pain comes on. If pains are violent and continuous you may check them by pinching the back or by putting a tight surcingle around the body in front of the udder. These failing, $1\frac{1}{2}$ ounces of chloral of hydrate in 1 quart of water may be given to check the pains. If the passages have dried up or lost their natural lubricating liquid, smear the interior of the passages and womb and the surface of the calf as far as can be reached with pure, fresh lard, or pure sweet oil may be run into the womb through a rubber tube (fountain syringe). In dragging up the fetus apply strong traction only while the mother is straining, and drag downward toward the hocks as well as backward. You thus follow the natural curvature of both fetus and passages and render the extraction easier.

DISEASES FOLLOWING PARTURITION.

Flooding,

or Bleeding of the Womb, occurs at times in the cow, though not nearly so often as in the human female. The treatment should consist in the removal of the fetal membranes and clots from the womb (which will not contract while they are present), the dashing of cold water on the loins, right flank, and vulva, and if these measures fail, the injection of cold water into the womb through a rubber tube furnished with a funnel. In obstinate cases a good sized sponge soaked in tincture of muriate of iron should be introduced into the womb and firmly squeezed, so as to bring the iron in contact with the bleeding surface. When nothing else is at hand an injection of oil of turpentine will sometimes promptly check the bleeding.

or Casting the Withers, is, like flooding, the result of failure of the womb to con-

Eversion of the Womb,

tract after calving. Thus the whole organ may be turned inside out, sliding back through the vagina and hanging from the vulva. Treatment will vary somewhat, according to the degree of the eversion. In partial eversion, womb protruding only slightly, cow standing, let an assistant pinch the back to prevent straining, while operator pushes his closed fist into the center of the mass and carries it back through the vagina, assisting in returning the surrounding parts by his other hand. In more complete eversion, cow still standing, let assistant check straining by pinching back, let two men hold a sheet so as to sustain the everted womb and raise it to the level of the vagina. Sponge clean with cold water, then with laudanum or weak solution of Phenalin. Plant closed fist in rounded end of the largest horn, push on it so as to turn it back within itself, carry it on through vagina, meanwhile using the other hand to assist in the inversion, etc. If womb has been long-everted, is gorged with blood, inflamed and friable, cow unable to rise, better call in a veterinarian and follow his directions. It may be necessary for him to amputate the womb.

Retention of the returned womb is the next point. This is best accomplished by a rope truss. Take two ropes, each about 18 feet long, 1 inch thick. Double each rope at middle, lay one above the other at the bend so as to form an ovoid about 8 inches in its long diameter. Twist each end of the one rope twice around the other so that the ovoid will remain when they are drawn tight. Tie a strap or rope around the back part of the neck and a surcingle around the body. Place rope truss on the animal so that the ovoid ring shall surround the vulva, the two ascending ropes on the right and left of the tail and the two descending ones down inside the thighs on the right and left of the udder. Carry these descending ropes forward on the middle of the back, twisting over each other, and tie to surcingle and collar. Upper and lower ropes are drawn tightly so that the rope in the ring is made to press firmly all around the vulva without risk of displacement. This should be worn for several days until the womb has closed and all risk of further eversion is at an end.

Retained Afterbirth.

Treatment of this well known and troublesome disease in cows must vary according to the conditions. When cow is in low condition, hot drinks and hot mashes of wheat bran or other aliment, to which is added Davis Stock Food in proportion of 2 tablespoonfuls to each feed, may be sufficient. If bowels also are somewhat confined, 1 pound of ground ginger, or $\frac{1}{2}$ ounce of black pepper, given with 1 quart of sweet oil, or $1\frac{1}{2}$ pounds of Glauber salts, the latter in at least 4 quarts of warm water, will often prove effectual. Also give a bottle or two of flaxseed tea at frequent intervals. Ergot of rye, 1 ounce, or extract of same, 1 dram, may be used to induce contraction of the womb. Mechanical extraction of the afterbirth membranes is, however, often necessary, and we shall here give what we consider to be the two best of several methods in use among practitioners: (1) Hang a weight of 1 or 2 pounds to the hanging portion, and allow this, by its constant dragging and by its jerking effect when the cow moves to pull the membranes from their attachments, and to stimulate the womb to expulsive contractions. This method has the

disadvantage that in neglected cases, when the dependent mass is already badly decomposed, the weight is liable to tear it in two, leaving a portion of the offensive material imprisoned in the womb. Again, this uncontrolled dragging upon the relaxed womb will (in exceptional cases only, it is true) cause it to become everted and to protrude in this condition from the vulva. (2) The skilled hand method, and certainly the most prompt and successful, is as follows: First let the operator strip and dress as for parturition cases. Remember, the operation should be undertaken within twenty-four hours after calving; later it will be difficult. Smear your arms with carbolized lard or vaseline to protect them against infection, particularly if it is a delayed case with putrid, offensive membranes. Let an assistant hold the tail to one side, while you seize the hanging afterbirth with the left hand, introducing the right along the right side of the vagina and womb, letting the membranes slide through your palm until you reach the first cotyledon to which they remain adherent. If no such connection is within reach, gentle traction is made on the membranes with the left hand until the deeper parts of the womb are brought within reach, and the attachments to the cotyledons can be reached. Then the soft projection of the membrane, which is attached to the firm, fungus shaped cotyledon on the inner surface of the womb, is seized by the little finger, and the other fingers and thumb are closed on it so as to tear it from its connections. To explain this it is only necessary to say that the projection from the membrane is covered by soft conical processes, which are received into cavities of a corresponding size on the summit of the firm, mushroom shaped cotyledon growing from the inner surface of the womb. To draw upon the former, therefore, is to extract its soft villous processes from within the follicles or cavities of the other. It is at times difficult to start this extraction, and it may be necessary to get the finger nail inserted between the two, and once started the finger may be pushed on, lifting all the villi in turn out of their cavities. This process of separating the cotyledons must be carefully conducted, one after another, until the last has been detached and the afterbirth comes freely out of the passages. In the great majority of cases this method, if the job be performed by a careful man, knowing something about the anatomy of a cow, will prove successful. Always have an antiseptic wash of Phenalin or carbolic acid solution near you when performing this operation. You should be able to remove the whole mass together with one operation. Take care in the operation not to cause eversion of the womb. If carefully conducted, so as not to tear the cotyledons of the womb, this operation, as stated, is eminently successful, the cow suffers little, and the straining aroused by the manipulation soon subsides. Keeping in a quiet, dark place, or driving a short distance at a walking pace will serve to quiet these. When the membranes have been withdrawn the hand, half closed, may be used to draw out of the womb the offensive liquid that has collected. If the case is a neglected one and the discharge is very offensive the womb must be injected as for leucorrhœa.

Inflammation of the Vagina,

or Vaginitis, may occur independently of inflammation of the womb, usually as the result of bruises, lacerations, or other injuries sustained during calving. It is shown by a swelling of the lips of the vulva, which, together with their lining membrane, become a dark red or leaden color, the mucus discharge increasing, becoming whitish or purulent, and it may be fetid. In all severe cases of this nature Phenalin or other antiseptic solutions must be assiduously used. Use carbolic acid, $\frac{1}{2}$ ounce to 1 quart of water, or chlorine water, or peroxide of hydrogen solution may be injected at least three times a day. Hyposulphate of soda, 1 ounce to 1 quart of water, is an excellent application, and the same amount may be given by the mouth.

Leucorrhœa,

mucopurulent discharge from the passages, is due to a continued or chronic inflammation of the womb, the vagina or both. It is so well known that little mention of its cause need be made here. Treatment with the injections advised for vaginitis is successful in mild or recent cases. In obstinate ones stronger solutions of Phenalin or carbolic acid must be resorted to, after the womb has been washed out by a stream of tepid water until it becomes clear. A rubber tube is inserted into the womb, a funnel placed in its raised end and the water, and afterward the solution, is poured slowly through this. If the neck of the womb is close so that the liquid cannot escape, a second tube may be inserted to drain it off. As injections may also be used chloride of zinc, $\frac{1}{2}$ dram to 1 quart of water, or sulphate of iron, 1 dram to 1 quart of water.

Three drams of sulphate of iron and $\frac{1}{2}$ ounce of ground ginger may also be given in the feed daily, and in order to keep the digestion and circulation healthy and normal Davis Stock Food should be fed regularly, 1 tablespoonful to each feed.

Inflammation of the Womb

may appear two or three days after calving. The cow shivers; hair stands erect along the spine; horns, ears and limbs are cold; the pulse is small and hard, also rapid, registering 70 to 100 degrees; appetite is lost; rumination ceases; pressure on the right flank gives manifest pain, causing moaning and grunting.

Examination through the rectum detects enlargement and tenderness of the womb. When the neck of the womb is touched the cow winces with pain. The discharge from the vulva is at first watery, but becomes thick, yellow and finally red or brown, with a heavy, fetid odor.

Treatment.—In slight cases of simple inflammation use the vaginitis treatment, but take care that injections penetrate into the womb. After having washed out the womb with a 1 per cent solution of Phenalin, 1 ounce of glycerine and laudanum added to render it more soothing, it will usually answer every purpose. Open the bowels with $1\frac{1}{2}$ pounds of Glauber salts, with 1 ounce of ginger in 4 quarts of warm water, if required. You may also apply fomentations of warm water or even mustard poultices or turpentine to the right flank. In violent cases give salicylate of soda, $\frac{1}{2}$ ounce, or quinia, 2 drams, repeated every four hours, to lower the temperature and counteract septic poisoning. Tincture of aconite may be used in 20-drop doses every six hours. If temperature rises to 106 or 107 degrees Fahrenheit, meet it by giving Bradbury's Brazilian Specific and direct applications of cold or iced water to the surface. Animal may be covered with wet sheets and cold water poured on these at intervals until temperature in rectum is lowered to 102 degrees Fahrenheit. In summer cow may be allowed to dry spontaneously, while in winter it should be rubbed dry and blanketed. Carefully guard against infection of hands and arms in treating a cow for this disease. Smear arm and hand with lard or solution of Phenalin before introducing it into the passage.

MILK FEVER: Its Simple and Successful Treatment.

Preliminary Remarks.

Milk fever is a very common and until recently a frequently fatal disease, affecting cows in all the large dairy districts of this and other countries. As it usually attacks the best milking members of the herd, and at a time when the milk flow is the heaviest, the malady is one which has caused very severe losses to our dairy industry. It is therefore of the greatest economic importance that every milk producer acquaint himself with the present extremely successful methods of treating this disease, especially the injection of filtered atmospheric air into the udder. This form of treatment has been adopted within a comparatively recent time, and in view of the uniform success that has followed, every dairyman should become familiar with its use and should provide himself with a suitable apparatus for its application, especially if he is located where the services of a competent veterinarian cannot be secured. This method of dealing with the disease does not make the assistance of the veterinarian undesirable, in case it is obtainable, as the veterinarian may frequently be of the greatest assistance in treating complicated symptoms should they arise.

Name and Synonyms.

The common name for this malady—milk fever—is an erroneous and misleading one, as in reality fever is usually absent; instead, there is generally an actual reduction in body temperature. A far better and more distinctive term, and one that describes the actual condition much more precisely, is parturient paresis. The disease has also several other names in various parts of the country, such as calving fever, parturition fever, parturient apoplexy, parturient collapse, puerperal fever, vitulary fever, and dropping after calving.

Description of Disease.

Milk fever is a disease of well nourished, plethoric, heavy milking cows. It occurs during the most active period of life (fourth to sixth calf), and is characterized by its sudden onset, and the complete paralysis of the animal with loss of sensation, and by following closely the act of calving, or parturition, terminating in a short time in recovery or death. One attack predisposes the animal to a recurrence of the trouble. While this disease may occur at any time during the whole year, it is seen principally during the warm summer season. The affection is almost entirely confined to the cow, although a few cases have been reported in the sow and goat. Sheep are entirely free from the disease.

Predisposition and Cause.

There are few diseases among our domesticated animals regarding the exact cause of which more widely different theories have been advanced than that of milk fever. The causes may properly be divided into two kinds—predisposing and direct. Experience shows one of the most prominent predisposing causes to be the great activity of the milk secreting structure, namely, the udder. This organ is most active after the fourth, fifth and sixth parturition, and this is the time of life when the vast majority of cases occur. The disease is almost unknown in heifers with the first calf and decreases in frequency steadily after the most active milking period is past. It is rarely, if ever, met with in pure beef breeds, such as the Shorthorn, Angus and Hereford, while its main inroads are made in the heavy milking breeds, such as the Holstein, Jersey, and Guernsey. Another factor that is probably of equal importance with the activity of the udder in producing the disease is the existence of a plethoric condition of the system, the result of excessive feeding and lack of exercise before calving. In heavy milking cows all the feed eaten in excess of that required to make up for the normal waste of the system is turned into milk and not used for the laying on of flesh or fat. Fleshiness is therefore an unnatural condition in these animals and the period during which they are dry is usually very short; indeed, many of these cows continue to secrete milk right up to the time of calving. In those cases where the animals go dry the excess of nutriment in the feed has no avenue of escape and immediately becomes stored up in the glands and in the blood, throwing the system into a high state of plethora. Now, at the time of calving all the blood which has been supplying the fetus is suddenly thrown back on the circulation, and if the udder does not begin active secretion very promptly, plethora becomes extreme. The blood plasma under these conditions is very rich and dense, containing a large percentage of albumen and glycogen, and causing a shrinkage in size of the blood cells. This condition is invariably seen when the blood of milk fever patients is examined under the microscope.

Fatness of the animal has been ascribed an important place among the causes of milk fever. This, however, in itself, is probably not a predisposing cause. The beef breeds (Angus and Shorthorn) are usually in far better condition at the time of calving than the milking breeds (Jersey and Holstein), and yet milk fever is a rarity in the former. At the same time it must be understood that a fat Jersey is more predisposed than one poor in flesh. In the fat Jersey the system is already loaded with an excess of nutriment and, at the time of calving, extreme plethora is more readily produced than in the thin animal where the excess of nutritive elements could be more readily used and stored in the depleted muscular and glandular structures of the body. Fatness is therefore only of importance in the production of the disease in so far as it tends to increase glandular activity, particularly of the udder, and because of the higher state of plethora of the fat animal.

Regarding the direct cause of milk fever numerous theories have been advanced by various investigators, but only to be abandoned as further discoveries in pathology were made. Thus Schmidt, of Muhlheim, basing his theory upon the striking resemblance of the symptoms of milk fever to those of sausage poisoning, claimed that the former was due to an auto-intoxication, produced by the absorption of toxins from the uterus. This was a great advance over the theories which up to this time had been considered. Nevertheless, the medication recommended by this writer, which aimed at the anti-septic treatment of the womb, failed to decrease the great mortality of the disease, and his theory was finally entirely superseded in 1897 by that of J. Schmidt, of Kolding, Denmark. This able investigator first directed attention toward the udder by claiming (as Schmidt, of Muhlheim, had done) that the disease was an auto-intoxication, but produced by the absorption from the udder of leucomaines, resulting from the decomposition of the first milk (colostrum). Following up this idea Schmidt considered that

the treatment should be directed toward retarding the secretion of the udder and at the same time neutralizing the leucomaines, or toxins, already present, by the use of some antitoxic agent. He therefore advocated the injection into the udder of an aqueous solution of potassium iodide, which method was followed by an immediate decrease of the mortality to a very marked degree. The great success attendant upon this line of treatment at once gave the theory general recognition, and this very difficult problem was at last thought to be solved. Within the last few years the injection of etherized air, oxygen, and sterile atmospheric air have been used with wonderful success, reducing the death rate much lower than the potassium iodide had done. It therefore seems that a thorough distention of the udder is far more important than the antitoxic action of potassium iodide.

In explanation of the efficiency of this treatment some writers have claimed that after calving the determination of blood suddenly changed from the uterus to the udder, which produces an anemia (bloodlessness of the brain). By thoroughly distending the udder the pressure therein causes a decrease in its circulation, which tends to equalize the distribution of the blood in other parts of the body, thus relieving the anemia of the brain and the consequent symptoms of milk fever. It has also been suggested that the highly favorable results obtained by the injection of atmospheric air and other gases into the udder are due to the fact that milk fever is produced by an anaerobic organism (a germ unable to live in the presence of air) which invades the udder. If this should prove true it is probable that this organism remains localized in the udder, as the bacillus of lockjaw remains localized at the point of injury, and produces a highly potent toxin, which, when absorbed into the system, has a specific action on the nerve centers. These theories, however, have not been proved, and the determination of the cause of this affection still requires investigation.

Symptoms.—This disease in its typical and most common form is comparatively easy to diagnose and one which almost every dairyman knows immediately before the arrival of the veterinarian. It usually comes on within two days after the birth of the calf and is practically never seen after the second week. In isolated instances it has been observed a few days before calving. At the commencement of the attack there is usually excitement; the cow is restless, treads with the feet high, switches the tail, stares anxiously around the stall or walks about uneasily. She may bellow occasionally, show slight colicky symptoms, and make ineffectual attempts at relieving the bowels. These symptoms are rarely recognized by the owner, but they are followed within a few hours by beginning paralysis, indicated by a staggering gait, especially in the hind legs, and by weakening of the knees and fetlocks in front. The patient now becomes quieter, the gait more staggering and weak, and finally the animal goes down and is unable to rise. The paralysis by this time is general, the calf is unnoticed, and the cow lies perfectly quiet with the eyes partly closed and staring and showing a complete absence of winking when the eyeball is touched. She is absolutely unheeding of her surroundings and flies may alight with impunity on all parts of the body without causing the slightest movement to dislodge them. While down the patient assumes a very characteristic position which is of great aid in diagnosis. The head is turned around to the side (usually the left) and rests on the chest, causing a peculiar arching of the neck. If the head is drawn out straight, it immediately flops around to the side again when the force is removed. The body usually rests slightly to one side, with the hind legs extended forward, and the fore legs doubled up in their normal position. This is paralysis of the muscles of the throat, so that swallowing is impossible, and in case drenching is attempted there is great danger of the fluids going into the lungs and setting up traumatic pneumonia. Paralysis of the rectum and bladder is also complete and the movement of the intestines is so suppressed that purgatives are frequently powerless to reestablish it. Fermentation in the paunch with consequent bloating is sometimes seen, particularly when the patient is allowed to be stretched out on her side. The secretion of milk is diminished and may be suspended entirely. Sugar is voided in the urine, depending in quantity on the severity of the attack. The pulse is weak and at times hardly susceptible to the finger, averaging from 50 to 70 beats per minute. Later in the disease, however, and especially in those cases with unfavorable terminations, it may reach 100 per minute. There is seldom noticed a rise in temperature. Sometimes at the commencement of the attack the temperature may reach 103 degrees Fahrenheit, but there is a steady decrease to as low as 95 degrees Fahrenheit, as the disease progresses. The temperature rapidly rises again as improvement is manifested. Convalescence occurs rapidly, and on the day following the onset of the disease, and in

some cases even within a few hours, the animal may be up eating and drinking in a normal manner. Sometimes, however, a slight paralysis of the hind quarters persists, and may remain for a week and even longer, indicating that some structural change must have occurred in the nerve centers. In fatal cases the animal may remain perfectly quiet and die in a comatose condition from complete paralysis of the nervous system, but more frequently there is some agitation and excitement prior to death with tossing about of the head. Death, like recovery, usually occurs in from eighteen to seventy-two hours after the onset of the malady.

Appearances After Death.—The post mortem appearances in an animal that has succumbed to this disease are frequently entirely negative and not in the slightest degree characteristic. This further upholds the theory that milk fever is an intoxication and not a bacterial infection, as in the latter case the lesions would be more marked and distinguishable. The post mortem also fails to substantiate the fermentation theory of Schmidt-Muhlheim, as the uterus is usually found contracted and its mucous membrane intact. The third stomach is sometimes found impacted with dry, hard masses of feed, and there may be some fermentation in the intestines. Sugar in varying percentage is always found in the urine in the bladder as well as in that drawn prior to death. Various particles of feed may be found in the larynx, together with congestion and swelling of the mucous membrane of the trachea and bronchi. Pneumonia, traumatic in origin, may also be observed if drenching has been attempted after paralysis of the throat has occurred. The blood usually appears dark and thick and congestion of the spinal cord and of the base of the brain is also quite frequently present.

Prognosis and Mortality.—Prior to the introduction of the Schmidt treatment milk fever was considered an exceedingly serious malady and the death rate was placed by various authors at 40 to 50 and even 70 per cent. However, after the introduction and general application of potassium iodide injections into the udder, the mortality was reduced in Denmark and Germany to 17 per cent, and in Switzerland to 22 per cent, and in Austria to 25 per cent, while in this country the statistics collated at the Iowa Experiment Station shows 119 recoveries without complication out of 166 cases, a mortality of 28 per cent. Since the use of sterile atmospheric air for the injection of the udder, the death rate is even much lower than with the potassium iodide treatment, and in Denmark out of 914 patients, 884, or 96.7 per cent recovered. In general, the nearer the attack follows the act of calving the more severe it proves and the graver the danger. The severity also greatly increases with each subsequent attack.

Treatment.—In the administration of medicine by the mouth, and especially drenches, great care should be taken to prevent the fluids from getting into the larynx and from there into the lungs where they will set up traumatic pneumonia, which is almost invariably fatal. In case the throat is not paralyzed the drench may prove of value and should be given slowly and immediately stopped at the first sign of uneasiness or coughing on the part of the animal. While the patient lies on the side she must raise the weight of her body at each inspiration, which is very exhausting, and hypostatic congestion of the dependent lung is greatly favored. Consequently it is of importance that the cow should be kept propped up on the breastbone by means of bags of chaff or straw placed against her side. In the way of medicinal treatment purgatives may be given in the first stage of the disease when the animal can swallow, with the precautions above mentioned. One pound of Epsom salts and 2 ounces of creolin dissolved in 1 pint of water will prove beneficial. The creolin is added for its antiseptic action to prevent fermentation in the paunch with the consequent danger of the eructation of feeds and their subsequent passage into the windpipe. Ammonium carbonate in 2-dram doses dissolved in 2 ounces of water will be found to act equally as well as the creolin in this respect. Epsom salts is rather slow in its action, and an injection under the skin with a hypodermic syringe of $1\frac{1}{2}$ to 2 grains of eserine sulphate, when obtainable, will be found quicker and more efficacious. The rectum should be emptied and injections of 1 to 2 gallons of warm water given to stimulate intestinal movements. However, the normal movement of the bowels, once lost, is exceedingly hard to reestablish, and sometimes all efforts in that direction fail. The urine should be drawn with a catheter or by pressure on the bladder with the hand in the rectum, as the bladder is paralyzed and unable to empty itself.

The feeble pulse and subnormal temperature call for the administration of stimulants. Injections under the skin of 1 dram of the following solution every three hours are probably the most efficacious: 80 grains of caffeine, 60 grains of sodium salicylate, and 4 drams of water. Similar injections of 1 grain

of strychnia sulphate three times daily will also be found very beneficial, although numerous other drugs may be recommended, as spirits of camphor, veratrin, tincture of digitalis, alcohol, etc. In case the animal is very excitable the head should be restrained in such a manner as to prevent injury, and, in case the violence becomes excessive, $1\frac{1}{2}$ ounces of chloral dissolved in 1 quart of water may be injected into the rectum, or 5 grains of morphine sulphate under the skin.

The Potassium Iodide Treatment.—As previously stated, Schmidt, of Kolding, advanced the theory in 1897 that the cause of milk fever was the absorption of leucomaines from the udder, and recommended that potassium iodide be injected to prevent the formation of the toxin and to neutralize that already existing. This was the most rational theory so far advanced and the treatment proved to be beneficial, being followed by astonishingly good results. After this treatment was generally resorted to throughout Europe and America, the death rate fell from 40 per cent to 17 per cent. The apparatus required for the Schmidt treatment is exceedingly simple, and consists of a piece of rubber tubing about 4 feet long, to one end of which is attached an ordinary milking tube which is inserted into the teat. At the other end a funnel is fitted, into which the solution is poured. Previous to the injection the udder should be thoroughly milked out and washed off with warm water and soap, followed by a 5 per cent solution of carbolic acid or creolin. A clean towel should be placed under the udder to keep it from coming in contact with the stable litter or other filth. Two and one-half drams of potassium iodide are then added to 1 quart of water previously boiled for fifteen minutes and allowed to cool to the temperature of the body. The funnel and tubing should likewise be disinfected before the injection. The milking tube is inserted into the four teats in succession, each quarter of the udder, after it has been milked out clean, receiving $\frac{1}{2}$ pint of the liquid. The udder should then be thoroughly massaged to make sure that all the milk canals are penetrated by the liquid. In case improvement does not occur the injection may be repeated once or twice at intervals of eight hours, always observing the same antiseptic precautions, as it is possible to produce a gangrenous mammitis (caked bag) and ruin the udder by careless injections which introduce pathogenic bacteria. This danger, however, is entirely obviated by the use of ordinary antiseptic precautions, as described above.

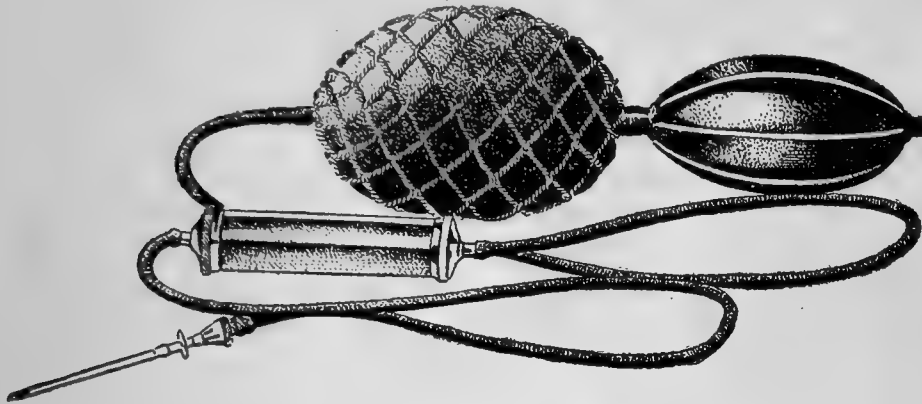
The New Air Treatment.

Of all known methods of treating milk fever, the injection of sterile atmospheric air into the udder with the Davis Milk Fever Outfit is by far the most simple and practicable as well as the most efficacious and harmless one at our disposal, and only occasionally requires that medicinal treatment be given.

For a considerable length of time the entire value of Schmidt's treatment was considered to be the antitoxic action of potassium iodide, and soon numerous investigators began injecting various other antiseptics, such as carbolic acid, creolin, etc., with equally good results. Sterile water and sterile salt solutions were tried with no increase in the mortality, and it was therefore considered that the distention of the udder was as important a factor as the antitoxic action of the iodide of potash. Continuing along these lines, Kortman used antiseptic gases (etherized air) with beneficial results. Oxygen was then tried by Knusel with increasing success and the deaths among the experimental cases virtually ceased. The apparatus for treating with oxygen and etherized air, however, are expensive and cumbersome, and this greatly limits their use by the average practitioner.

To Anderson, of Skanderborg, belongs the credit of first having made use of plain atmospheric air, although Schmidt had previously recommended the admittance of air with the potassium iodide solution for the purpose of obtaining greater diffusion of the liquid. Anderson first injected air along with sterile water and then by itself. The results were astonishingly successful. Thus Schmidt reports that out of 914 cases treated in Denmark, 884, or 96.7 per cent, were restored to health. The record of 140 of these animals shows that recovery occurred in the average time of $6\frac{2}{3}$ hours. Of this number twenty-five cases required a second injection, while in three of the latter number it was necessary to give a third treatment before they were able to get upon their feet. The treatment is also practically harmless, as the statistics of the above mentioned 914 patients show that only one cow was affected with a severe attack of caked bag after this treatment, while in four other cows a milder inflammation of the udder was apparent. Equally good results have likewise been obtained in this country.

The method of injecting filtered air into the udder is easy of manipulation, requires but little time, and is readily accomplished by means of the Davis Milk Fever Apparatus, such as is shown in the illustration. It consists of a metal cylinder with milled screw caps on either end. Cap may be removed in order to place sterile absorbent cotton within the chamber. To this cap the rubber bellows are connected by 9 inches of rubber tubing.



Davis Milk Fever Outfit.

Cap is to be removed together with the attached 18 inches of rubber hose, at the free end of which is the self retaining milking tube for the purpose of disinfection before treating each case. The pulling on or off of the tubing on the nozzles of the milled caps is thus rendered necessary. Within the metal cylinder is a wire net, which prevents the obstruction of the outlet of the chamber by holding back the sterile cotton, and also

permits of the unscrewing of the lower cap and the disinfection of this portion of the apparatus, including the milking tube, without contaminating the packing. Absorbent cotton impregnated with carbolic acid (carbolyzed cotton) or other suitable disinfectant, can be purchased from the drug trade in most localities and is better, though slightly more expensive, than the plain cotton.

Previous to making the air injection, the hands of the operator should be thoroughly cleansed and the udder should receive the same careful antiseptic treatment as has been recommended in discussing the injection of the potassium iodide. Soap and water should be applied to the teats and udder, after which they should be carefully disinfected with a 5 per cent solution of carbolic acid (3 teaspoonfuls of pure carbolic acid to 1 quart of water). A clean towel should then be placed under the udder to prevent the teats from coming in contact with dirt or filth of any kind. The milking tube, before it is placed in the teat, should have been perfectly sterilized by boiling fifteen minutes, with the lower hose and cap of the cylinder attached, and the apparatus should be wrapped in a clean towel, without touching the milking tube, to prevent contamination before use. If the apparatus has been subjected to this treatment shortly before and it is desired to disinfect only the milking tube, the latter may be placed in a 5 per cent solution of carbolic acid for five minutes. It is then carefully inserted into the milk duct of the teat without emptying the udder of milk. Air is now pumped from the bulb into the reservoir and thus a continuous flow of air is forced through the filtering chamber and into the udder. Slight massage, or kneading of the udder will cause the innermost recesses of the milk tabules to become distended with the injected air. After one-quarter of the udder is well distended the milking tube is removed, care being taken to prevent the outflow of air by having an assistant tie a small piece of tape about the teat at the time the milking tube is withdrawn. The same treatment is repeated with the other three teats until the udder is satisfactorily distended. In case the air becomes absorbed and no improvement is noted within five hours, a repetition of this treatment should be made under the same antiseptic precautions as at first. The tape should be removed from the teats two or three hours after the cow gets on her feet, the constricting muscles at the tip of the teats being now depended on for retaining the air. In this manner the air may be left in the udder for twenty-four hours, and when recovery is assured, it should be gradually milked out. It is needless to say that the calf should not be permitted to suck during this period.

Inflammation of the udder (caked bag) is avoided if the milking tube is thoroughly disinfected before each application, and if the cow's teats and bag and the hands of the operator have been properly cleansed. If the apparatus is kept in its case free from dust and dirt, the absorbent or medicated cotton in the metal cylinder will efficiently filter enough air to distend the udders of six cows. After this number has been treated it is advisable to replace the old cotton with a fresh sterile supply, which should be placed loosely in the cylinder.

While this method of treating milk fever is comparatively easy for a farmer or dairyman to adopt, he cannot expect to have the same successful results as those obtained by a skilled veterinarian, and it is therefore advisable that the services of such a veterinarian should always be obtained in those districts where it is possible. In many cases it will be found that the injection of air into the udder will be sufficient to combat the disease without any other treatment, but it is always advisable to study the symptoms of each individual case and administer in a rational manner the indicated medicines.

Prevention.—Until recently most stringent measures were resorted to by every careful dairyman to prevent the development of the disease in his herd. However, since the treatment of the present day has so greatly reduced, and even in some cases obliterated the mortality, prevention is no longer such an important problem and therefore preventive measures which have a severe and lasting effect upon the animals should be abandoned from an economic standpoint. It has long been advocated to starve all suspected animals for two weeks prior to the birth of the calf. It is frequently noted that this has an injurious effect on the milk flow of the animal, from which it may require several weeks for her to recover and gain her normal output of milk. This measure is no longer considered advisable, as it is better to have the cows attacked with the disease once in a while (the mortality being less than 5 per cent) than to decrease the flow from every heavy milking cow for one or two weeks after she comes fresh by starving her before calving.

A method which is not quite so sure of reducing the plethoric condition of the cow, but which nevertheless proves very efficient and is without the slightest permanent injurious effect, is the administration of 1 to 1½ pounds of Epsom salts two or three days prior to calving. In case this has been neglected and a well nourished, heavy milking cow has passed through an easy, non-exhausting calf birth, the administration of the salts after the labor is over should by no means be neglected. Blood letting has also been advocated, but there is always the danger of exciting the blood making organs to excessive activity, thus largely neutralizing the effect. It should therefore be resorted to only when the cow is extremely fat, is a heavy milker, and has had one or more previous attacks. The blood should be drawn from the jugular vein until the pulse softens perceptibly, 1½ pints for every 100 pounds of the animal's body weight being about the right amount.

Another very good preventive measure and one easily carried out, though frequently overlooked, is to give the cow plenty of exercise up to the time of calving. Many animals are allowed to run continuously on pastures from the time they go dry until a week or two before calving, when they are transferred to the stable without any subsequent exercise. This is very conducive to the enriching of the blood and the development of the disease.

The most recent preventive treatment suggested is in line with the favorable results obtained by the injection of air into the udder. It consists in allowing the susceptible cow to retain in the udder for twenty-four hours after calving all the milk except the small quantity required by the calf, which should be taken if possible from each quarter. The distention of the udder naturally follows as in the air treatment and acts as a preventive against milk fever. In the Island of Jersey and at the Biltmore Farms, N. C., where this practice is common, the number of milk fever cases has been greatly lessened. General sanitary conditions should also be looked after, such as the supply of pure air and clean stabling, with plenty of clear, cool water and laxative feeds, such as grasses and roots. Some observers who believe in the microbic origin of the disease have recommended the cleaning of the manure and dirt from the animal and spraying the hind quarters and genitals with a 4 to 5 per cent solution of Phenalin, carbolic acid, lysol, or creolin just prior to calving. From our present knowledge of the disease, however, this is probably unnecessary.

Palsy After Calving—Dropping After Calving consists of a more or less complete loss of control of the hind limbs occurring after calving, and due either to low condition, weakness, and exposure to cold, or to injurious compression of the nerves of the hind limbs by a large calf passing through the pelvis. Its symptoms do not differ from those of palsy of the hind limbs, occurring at other times, and it may be treated in the same way. Bruises of the vagina may demand special soothing treatment.

Congestion of the Udder

Camphorated ointment is good.

Inflammation of the Udder,

may occur in heavy milkers before and just after calving. Friction, the sucking of a hungry calf and the kneading it gives the udder with its nose, will help to relieve it. Active rubbing (being administered three times a day when the cow is milked), etc.; will also aid in correcting this condition. accompanied with fever, should be treated by giving the patient copious drinks of warm water thrown in from horn or bottle; equally copious warm injections; the application of heat in some form to the surface of the body (by a rug wrung out of hot water, etc.) The administration of a pint of strong alcoholic liquor, or of 1 ounce of ground ginger, may serve to cut short the attack. After half an hour's sweat, rub dry and cover with a dry blanket. If, on the other hand, there is little or no fever, and only slight inflammation, rub well with camphorated ointment, or a weak iodine ointment, or Davis Veterinary Liniment, and milk three, four, or six times a day. Milking should be done with gentleness, squeezing the teat instead of stripping and pulling it. To keep the digestion and circulation active, feed Davis Stock Food, 2 tablespoonfuls to each feed, with the ration. This will also act as a tonic and invigorator. If abscess of the affected part threatens, it may be favored by fomentation and opened as soon as fluctuation from finger to finger shows the formation of matter at the point formerly hard. Gangrene is often fatal in these cases and demands the attention of a veterinarian. But the simple abscess, after it is opened, you may attend to, dressing it twice daily with a lotion of Phenalin, water and glycerine—Phenalin, 1 part; water, 20 parts, and glycerine, 1 part.

Suppression of Milk.

Absence of milk in the udder may result from ill health, debility, emaciation, chronic disease of the bag, wasting of the gland from previous disease, or insufficient feed. Treatment will consist in removing the cause of the disease, to feed well on rich albuminoid feed made into warm mashes. Davis Stock Food, given in the usual proportion, will here prove of the utmost value, and will speedily restore a plentiful flow of milk. In cases where the cow has a tendency to give bloody milk, the treatment should vary with the cause. In congested glands give 1 pound of Epsom salts, and daily thereafter $\frac{1}{2}$ ounce of saltpeter, with 1 dram of chlorate of potash; bathe the bag with hot and cold water, and rub with camphorated lard. If the feed is too rich or abundant it must be reduced. If the cause is acrid plants these must be removed from pasture or fodder. Induration of the udder may be met by rubbing with a combination of iodine ointment, 1 part; soft soap, 2 parts; or mercurial ointment and soap may be used. Careful milking is imperative.

Blue Milk.

Watery milk is blue, but the presence of a germ (*Bacillus cyanogenus*) causes a distinct blue shade even in rich milk and cream. It may reach the milk after it has been drawn, or it may find its way into the opening of the milk ducts and enter the milk as it is drawn. In the latter case frequent milking and the injection into the teats of a solution of 2 drams of hyposulphite of soda in 1 pint of water will serve to destroy the germs.

Stringy Milk

may be caused by fungi developing in the liquid. Like most other fungi this does not grow out into filaments within the body of the cow, but in five or six hours after milking the surface layers are found to be one dense network of filaments. If a needle is dipped in this and lifted, the liquid is drawn out into a long thread. Impure water, water originating from black muck soil, and pools mixed with the dejections of the stock, will develop fungi of this character. Keep the cows away from such springs and other unsanitary and unhygienic conditions, and give each of them 2 drams of bisulphite of soda daily; always remembering to add Davis Stock Food to the daily feed ration and you will soon have pure, sweet and rich milk, with no trace of blood or strings to mar its quality.

Chapped Teats, Etc.

Chapped teats may be caused by anything which irritates them. Soothing applications of vaseline, or a combination of equal parts of spermaceti and oil of sweet almonds may be applied. If healing is tardy add 10 grains balsam of Peru to 1 ounce of ointment. If the irritation is very great, wash first with a solution of 1 dram of sugar of lead in 1 pint of water, and then apply benzoated oxide of zinc ointment. Warts on the teats

also are often quite troublesome. They may be greatly benefited or entirely removed by smearing them thickly after each milking with pure olive oil. If they persist they may be cut off with a sharp pair of scissors and the sore touched with a stick of lunar caustic. They may then be oiled and the caustic repeated as demanded to prevent their renewed growth.

Teat Blocked by Calculus (Stone). When the calcareous matter of the milk has been precipitated in the form of a smooth, rounded stone, or a fine, sand-like debris, it may cause obstruction and irritation. The milk usually will contain gritty particles. Extraction may be attempted by simple milking in the case of the finely divided gritty matter, or with the spring dilator in the case of the larger masses. Should this fail the teat may be laid open with a knife and sewed up again or closed with collodion, but such an operation is best deferred until the cow is dry.

In cases where the teats are blocked by warty or other growths inside, the condition may be relieved, at least with all looser growths, by snaring them with a fine spring passed as a loop through a fine tube (like a teat tube open at each end), and introduced into the teat. When this is impracticable, the only resort is to cut in and excise it while the cow is dry.

DISEASES OF YOUNG CALVES.

Bleeding From the Navel may occur in two conditions: when the cord is cut off too close to the navel and left untied, and when it tears off at the navel. It may also bleed when torn across naturally, if it is sucked by the dam or another calf. Where any cord is left it is always safe to tie it, and it is only when it is swollen and may possibly contain a loop of the bowel that there is danger in doing so. By pressing upward any bulky contents such danger is avoided. If torn or cut too close to be tied, the bleeding may be checked by applying alum, copperas, or for a fraction of a second the end of an iron rod at a dull red heat. If much blood has been lost it may be requisite to transfuse several ounces of blood, or a weak common salt solution into the open umbilical vein.

Urine Discharged Through the Navel. Before birth the urine passes from the bladder by a special tube through the navel and navel string into the outer water bag. This closes at birth, and in the calf the tube is drawn in toward the bladder. It is only in the bull calf that it is likely to remain open, doubtless because of the long, narrow channel through which the urine must otherwise escape. The urethra, too, is sometimes abnormally narrow, or even closed in the male. If part of the cord remains, tie it and allow the whole to wither up naturally. If the cord has been removed and the tube (urachus) protrudes, discharging the urine, that alone must be tied. If there is nothing pendant the urachus must be seized, covered by the skin, and a curved needle being passed through the skin and above the duct it may be tied along with this skin. A blister of Spanish flies, or better, Davis Veterinary Blister, causing swelling of the skin, will often close the orifice.

Abscess of the Navel sometimes occurs as the result of irritation from calving or by the withered cord, etc. Inflammation may attack the loose connective tissue of the navel to the exclusion of the urachus and veins, and go on to the formation of matter. In this case a firm swelling appears as large as a fist, which softens in the center and may finally burst and discharge. The opening, however, is usually small and may close prematurely, so that abscess after abscess is formed. It is distinguished from hernia from the fact that it cannot be returned into the abdomen, and from inflammation of the veins and urachus by the absence of swellings forward and backward along the lines of these canals. Treatment consists of an early opening of the abscess by a free incision and the injection twice a day of an astringent antiseptic (chloride of zinc, $\frac{1}{2}$ dram; water, 1 pint).

Pyemic and Septicemic Inflammation of Joints in Calves—Joint Ill—

occurs in young calves within the first few months after birth. The symptoms are swelling of one or more joints, which are very hot and tender. The calf is stiff and lame, lies down constantly and cares not to suck. There is very high fever and accelerated breathing and pulse, and there is swelling and purulent discharge (often fetid) from the navel. There may be added symptoms of disease of the liver, lungs, heart, or bowels. The important point, however, is to determine the condition of the navel in all such cases of diseased and swollen joints beginning in the first month of life. Cases of this kind, if they do not speedily die, tend to become emaciated and perish later in a state of weakness and exhaustion. Treatment in the main is antiseptic. Slighter forms may be painted daily with iodine; or an ointment of biniodide of mercury 1 dram and lard 2 ounces, may be rubbed on the affected joints daily until they are blistered. In case of swellings containing matter this may be drawn off through the nozzle of a hypodermic syringe and the following solution injected: Compound tincture of iodine, 1 dram; distilled (or boiled) water, 2 ounces. Internally the calf may take 5 grains quinia twice daily and 15 grains hyposulphite of soda, or 20 grains of salicylate of soda three times a day.

Umbilical Hernia—Breach at the Navel—

may exist at birth from imperfect closure of the muscles around the opening. The symptoms are a soft swelling at the navel, with contents that usually gurgle on handling, and can be returned entirely into the abdomen by pressure. Treatment is not always necessary. A small hernia, like an egg, in a new born calf will usually recover of itself as the animal changes its diet to solid feed and has the paunch fully developed as an internal pad. In other cases apply a leather pad 8 inches square around the body by two elastic bands connected with its four corners, and an elastic band passing from its front border to a collar encircling the neck, and two other elastic bands passing up over the back. Another most effective resort is to make a saturated solution of common salt, filter and boil it, and when cool inject under the skin (not into the sac) on each side of the hernia a dram of the fluid. A bandage may then be put around the body. In ten hours an enormous swelling will have taken place, pressing back the bowel into the abdomen. When this subsides the wound will have closed.

The Blue Disease—Cyanosis.

This appearing in the calf at birth is due to the orifice between the two auricles of the heart (foramen ovale) being too open, allowing the non-aerated (venous) blood to mix with the aerated (arterial) blood, and it is beyond the reach of treatment. It is recognized by the blueness of the eyes, nose, mouth and other mucous membranes, the coldness of the surface, and the extreme sensitiveness to cold.

Constipation.

At birth the bowels of the calf contain the meconium, a tenacious, gluey, brownish yellow material largely derived from the liver, which must be expelled before they can perform their functions normally. The first milk of the cow (colostrum, beestings), rich in albumen and salts, is nature's laxative to expel this now offensive material, and should never be withheld from the calf. If, for lack of this, from the dry feeding of the cow, or from any other cause, the calf is costive, straining violently without passage, lying down and rising as in colic, and failing in appetite, no time should be lost in giving relief by an ounce dose of castor oil, assisting its action by injections of soap suds or oil. Whatever meconium within reach should be carefully removed. It is also important to give the cow a sloppy, laxative diet.

Indigestion

may occur from different causes, such as costiveness; too liberal a supply of milk; too rich milk; the furnishing the milk of a cow long after calving to a very young calf; allowing a calf to suck the first milk of a cow that has been hunted, driven by road, shipped by rail, or otherwise violently exercised; allowing the calf too long time between meals so that impelled by hunger it quickly overloads and clogs its stomach; feeding from the pail of milk that has been held over in unwashed (unscalded) buckets, so that it is fermented and boiled; keeping the calves in dark, damp, filthy, ill smelling pens, etc. Symptoms are dullness, indisposition to move, uneasiness, gas, sour breath, loss of appetite, lying down and rising as if in pain, fullness of the abdomen. The costiveness at first gives place to diarrhea.

Treatment.—Prevention is the best treatment, but if the trouble has been allowed to come on, 1 or 2 ounces of castor oil with 20 drops of laudanum may be given. For sourness, 1 tablespoonful of lime water or $\frac{1}{4}$ ounce of calcined magnesia; repeat three times a day. If disorder continues, 1 large tablespoonful of rennet, or 20 grains of pepsin may be given at each meal along with 1 tablespoonful of tincture of gentian. Davis Stock Food, $\frac{1}{2}$ tablespoonful to each feed, will be of great assistance. Any return of constipation may be treated by injections of warm water and soap. In case of the formation of loose hair balls inclosing milk undergoing putrid fermentation, temporary benefit may be obtained by giving 1 tablespoonful of vegetable charcoal three or four times a day, but the only real remedy for this is to cut open the paunch and extract them. This requires the service of a veterinarian. Remember that if you would avoid the various diseases in calves, the mother of the calf should be fed on succulent, nourishing feed, always adding 2 tablespoonfuls of Davis Stock Food to each feed; as soon as the calf commences to eat solid feed it should be given $\frac{1}{2}$ tablespoonful of Davis Stock Food to each feed. This will insure healthy circulation and perfect digestion in the young animal, and it will grow and thrive much more quickly than would otherwise be the case.

Diarrhea (Scouring) in Calves, Simple and Contagious. Scouring is a common result of indigestion. At the start it may be nothing more than an attempt of nature to relieve the stomach and bowels of irritating contents. As the indigestion persists, however, the fermentations going on in the undigested masses become steadily more complex and active, and what was at first the mere result of irritation of suspended digestion comes to be a genuine, contagious disease. The prevention of these cases is the prevention of constipation and indigestion with all their varied causes, the selection of a strong, vigorous stock, and, above all, the combating of contagion (diarrhea in its developed stage is caused by a contagious germ), especially in the separation of the sick from the healthy, and in the thorough purification and disinfection of the buildings (with Phenalin, carbol, whitewash, etc.), cleansing and sweetening of all drains, removal of dung heaps, and the washing and scraping of floors and walls. Feed the cows on succulent, nourishing feed, with Davis Stock Food always added to the ration, 2 tablespoonfuls to each feed while the calf is sucking, 1 tablespoonful when she serves simply as a milch cow. Calves fed by hand should be fed three times a day, the milk being of a temperature (slightly warmed) that agrees with them. The utmost cleanliness of feeding dishes should be preserved.

Treatment for diarrhea or scouring should vary according to the nature and stage of the disease. Davis Scour Cure will prove a sure and efficient cure after the irritant matter has been removed from the stomach and bowels. For this 1 or 2 ounces of castor oil may be given, according to the size of the calf. If the stools smell particularly sour, it may be replaced by 1 ounce of calcined magnesia, and in any case 1 or 2 tablespoonfuls of lime water should be given with each meal. If the outbreak is more general and evidently the result of contagion, the first consideration is to remove all sources of contamination. Test the milk of the cow with blue litmus paper, and if it reddens, reject the milk of that cow until by sound feeding, including Davis Stock Food with each feed, and perhaps a course of hyposulphite of soda and gentian root, her milk shall have been made alkaline. The castor oil or magnesia will still be demanded to clear away the infectious irritants, but they should be combined with anti-septics, and while the lime water and carminative mixture may still be used, a valuable addition is: calomel, 10 grains; prepared chalk, 1 ounce; creosote, 1 teaspoonful; mix; divide into ten parts and give one four times a day. Injections of solutions of gum arabic are often useful, and if the anus is red and excoriated $\frac{1}{2}$ dram of copperas may be added to each pint of the gummy solution. All the milk given must be boiled, and if that does not agree, eggs made into an emulsion with barley water, may be substituted. Small doses (tablespoonful) of port wine are often useful from the first, and as the feces lose their watery character and become more consistent, tincture of gentian in doses of 2 teaspoonfuls may be given three or four times a day. Counter irritants, such as Davis Veterinary Liniment, mustard, ammonia, or oil of turpentine may be rubbed on the abdomen when that becomes tender to the touch.

Rheumatism. Cattle exposed to severe cold or damp weather are likely to suffer from this disease, or it may appear as a sequel to some disease of the lungs or skin. Some animals seem to be naturally predisposed to it. In its nature it is inflammatory and is more likely to involve the organs of locomotion than any other, though the heart and other

internal organs are occasionally involved as a secondary result. It generally appears as a sudden lameness, with noticeable swellings around some of the joints of the affected limb, though it is quite likely that the swelling will not bear any proportionate relation to the amount of pain evinced. Disease may be confined to a limb, or more than one may be affected. May also appear simultaneously in various parts of the body. May suddenly disappear from one part and reappear in another. The local symptoms are always accompanied with constitutional disturbance of a feverish nature. Temperature likely to run up from 104 to 108 degrees Fahrenheit. In acute attacks mouth will be found hot and dry; pulse hard; secretion of urine lessened; urine acid in character, charged with impurities. Bowels are less active; there is a tendency to lie down continuously. Disease may become chronic.

Treatment.—At the outset give a purgative dose of Epsom salts, from 1 to 1½ pounds for an ordinary sized cow. If the pain is very acute it may be relieved by occasional doses of laudanum or opium, not more than 1 ounce of the former or 1 dram of the latter, three times daily. When opium is used care must be taken to keep the bowels acting regularly. For this purpose it may be necessary to give occasional small doses of Epsom salts. In conjunction with the above or alone, if opium is deemed unnecessary, give ½-ounce doses of nitrate or bicarbonate of potash three times a day. Keep patient comfortable, and the digestive and circulatory functions in proper working order by feeding Davis Stock Food regularly with the feed ration. This in itself may in all milder cases be all that is necessary to overcome the disease. It liberates the salivary and stomach juices, and through the enhancement of the digestive and assimilative powers, makes pure, healthy blood, freeing the system of the uric acid on the existence of which the symptoms of rheumatism are largely based.

SIMPLE SURGICAL OPERATIONS.

Ringing the Bull

ought always to be done before the calf has attained sufficient strength to make his resistance a matter of serious difficulty. An ordinary halter is usually all that is required, the strap being secured to a tree or post. A jointed steel or copper ring is ordinarily used. Copper is preferable. The method of punching a round piece out of the nasal septum for introduction of ring is objectionable, as it causes portions of the fine nervous filaments to be destroyed. Insertion of the ring by a trocar or canula is preferable. An eminent veterinarian states that for some years he has made use of a little instrument devised by himself, which can be made by any worker in metal, consisting of a steel point riveted into a shorter canula made to fit one end of the ring while open. When attached to the ring it easily and quickly passes through the septum, the half of the ring following, as a matter of course. It can then be removed and the ends of the ring brought together and fastened by means of the screw for that purpose. By this means any animal can readily be ringed by anyone in less time than it takes to describe the process; whereas, by any other method which necessitates first puncturing and piercing the septum and subsequently introducing the ring, the operation is (even when the struggles of the animal do not complicate matters) necessarily rendered tedious and uncertain by the fact that the openings through the skin and cartilage are not in apposition.

Dehorning.

Rightly done this need not be a cruel operation at all. The operation of dehorning causes pain certainly, as all surgical operations necessarily do, but it is not by any means more painful than many other operations (notably castration) to which we regularly subject animals without a second thought. Cruelty to animals is defined as the infliction of unnecessary pain. The pain in this instance is, according to well known veterinarians, transient as well as slight, and is insignificant before the severe and lasting injury daily inflicted by horned animals upon each other. Horns were necessary to cattle in their wild state, but domesticated and in confinement they become a menace to their companions and an encumbrance to themselves.

Moreover, a method has been devised providing against the growing of horns at all. The owner of the two or three days old calf if he decides on making it a mooly can dehorn it, or, to speak correctly,

prevent the horns from developing at all, by means of a chemical preparation which reduces the pain to a minimum, while it is even more effective than the saw and forceps. The most effective and therefore the cheapest of the several chemical dehorners which are freely advertised, is March's Chemical Dehorner, handled by Sears, Roebuck & Co. The operation which is uniformly successful if performed before the calf is three days old, is performed as follows: Catch the little animal and gently lay it over on its side. Let one of your assistants hold it there while you clip the hair off the trifling prominence on the frontal bone which marks the spot on the uppermost side of the head where the horn would develop ordinarily. Take your March's Chemical Dehorner and carefully apply it as directed over the part just clipped for say ten seconds. The calf is now turned over, the corresponding spot on the other side of the head is clipped and thoroughly treated in the same way as the first. This is by far the best method to dehorn animals intended for steers or dairy cows, and the only exception favoring the old method would be in the case of the bull, which, in order to protect ourselves against his viciousness, should be dehorned after he has learned to rely upon his horns as a weapon. Should we dehorn him as a little calf by the chemical process, he will naturally adopt as a weapon the catapult like tactics of the mooly, equally dangerous to man, or, humorously speaking, the question leaves us the choice of being butted to death or hooked to death. However, the bull deprived of his horns later on rarely develops these tactics, and becomes comparatively harmless.

The operation of dehorning mature animals is in itself simple and you can perform it yourself. Only be careful to guard against the struggles of the animal hurting itself or you or your attendants. Throw the animal and tie him securely. Fasten a strong halter and long rope around its girth before it is cast. Pass the free end of the rope through the ring on the halter and pull head back against the ribs. A hitch underneath the tail should bring the rope forward to the halter, where it may be fastened so as to be easily loosed when the first horn has been removed. To remove the other horn, loose the head, turn the animal over and refasten the head as before. The only instrument needed is an ordinary jointing saw, which should be used as quietly and quickly as possible. The bull may be dehorned at any time except in fly time or when the mercury is liable to drop to the zero point. It is well to deprive him of feed for twelve hours before dehorning.

Bleeding or Blood Letting

is sometimes necessary in disease, although it fortunately has become a rare operation. In the ox it is usually performed on the left jugular vein, which is large and easily rendered so prominent as to prevent the possibility of mistake, by tying a cord around the neck below the place where the incision is to be made. Rope should be tied in a slip knot, so as to admit of its being easily undone. The best instrument to use is a large bladed fleam. After the animal is secured, stand by its shoulder, the fleam in your left hand, blade just short of touching the skin and parallel to the direction of the vein, holding the stick or mallet with which to strike it in your right; one quick, sharp blow should be sufficient. If the hair is long, it is a wise precaution to moisten and smooth it down. When sufficient blood has been drawn the rope is removed and the orifice closed by means of a pin inserted through the lips of the incision in the skin only, and a piece of fine string or tow wound either over or under it, or in a circle between the skin and the pin. To prevent the animal from rubbing the part and tearing or dislodging the pin, it is advisable to tie the head up for a couple of days, providing the animal's health will admit of it, after which the pin may be removed and the wound left to heal in the usual manner. Remember in blood letting that the effectiveness of the operation depends more on the quickness with which the blood is drawn than on the quantity extracted, for the reason of which it is of importance that a liberal opening should be made into the blood vessel and the blood allowed to flow until a perceptible impression has been made upon the pulse.

Castration of the Male.

The castration of the male may be either what is called the uncovered or covered. In the former an incision is made down to the testicle proper, and in the latter you cut through the scrotum of the outside covering and through the dartos of the next coat, being careful to cut no deeper tissues or coats. The age at which the operation is performed varies, but usually it is performed between the second and third month. If done in early life there is less danger of complications. There are many different methods of operating, but we shall here only mention one or two of them which we consider the best. In

the uncovered operation a good, free incision should be made, exposing the testicle completely. Now it may be removed by simply cutting it off. The only danger of doing this is the hemorrhage that is likely to follow. To obviate this, before the division of the spermatic cord, it should be twisted several times in the following manner: Take hold of the spermatic cord with the left hand, having the cord between the thumb and the index finger. Now twist the free portion several times with the right hand, all the time being careful to push with the left hand toward the body of the animal. In this way the danger of injury to the cord during the animal's struggles will be overcome. The hemorrhage will be none or very little, if it has been done properly. This is the simplest manner of torsion. There are forceps and other instruments made to perform the operation in this manner. Instead of practicing torsion in any of its ways to prevent hemorrhage, we may apply a ligature either directly to the spermatic artery from which the hemorrhage comes, or to the entire cord. Use either a silk or catgut ligature. The next method with the clamps, although extensively used upon the horse, is not practiced to any great extent upon the bovine at the present time. A modern method for the castration of the bull which is very successful is by the ecraseur. The chain of the instrument is placed around the spermatic cord and tightened so as to crush the tissues and thus prevent hemorrhage. The clamp and ligature are the methods principally employed in the covered operation, and in order to thoroughly understand this procedure it will be necessary for you to have at least a crude anatomical knowledge of the parts. The former, or the uncovered, is the usual mode of operating, except in certain abnormal cases. If the animal is in any way abnormal, better call in a veterinarian to perform the operation.

Castration of the Female,

also called ovariectomy or spaying, should be performed when the cow is in her prime and giving the greatest flow of milk, care being taken that she is in good health and moderate condition, not too plethoric, or, on the other hand, anemic. Also that she be not in heat nor pregnant. The operation may be performed in two ways, by the flank or vagina, each operation having its special advantages. In the flank operation the animal may be operated upon either while standing or while in a recumbent position. If standing she should be placed against a wall or a partition and her head held by a strong assistant. The legs also must be secured to prevent the animal from kicking. A vertical incision should be made in the left flank about the middle of the upper portion, care being taken not to make the opening too far down, in order to avoid the division of the circumflex artery which traverses that region. The operator should now make an opening through the peritoneum, which is best done with the fingers. Next introduce the hand and arm into the abdominal cavity and direct the hand backward toward the pelvis, searching for the horns of the uterus. Follow them up and the ovaries will easily be found. They should then be drawn outward and may be removed either by ecraseur or torsion. The closing and suturing the wound will complete the operation. An adhesive plaster bandage can be beneficially applied. The operation by the vagina is more complicated, and as it requires technical knowledge and special and expensive instruments, we recommend you to employ a veterinarian if you decide to follow this method; in fact, if you do not possess some anatomical knowledge of the parts and their functions respectively, it is always better to call in a skilled practitioner when such operations are to be performed.

DISEASES OF THE SKIN.

Urticaria,

commonly known as Nettle Rash or Surfeit, is a mild inflammatory affection of the skin, characterized by sudden development of patches of various sizes, from that of a nickel to as large as a hand.

Causes.—Derangements of the digestive organs are the most common causes, such as overloading the stomach when the animal is turned out to graze in the spring, certain constituents of feed and high feeding among fattening stock. Spinal irritation and other nervous affections may produce it.

Treatment.—Administer a full dose of Epsom salts. Give soft, easily digested feed, to which always add 1 tablespoonful of Davis Stock Food to keep the digestion and circulation in order. Then

wash the affected parts with a solution of bicarbonate of soda (common baking soda), 8 ounces to the gallon of water, twice a day. If it assumes a persistent tendency, and you don't happen to have Davis Stock Food, give 1 tablespoonful of the following powder in the feed three times a day: Cream of tartar, sulphur, and nitrate of potash, equal parts by weight; mix.

Dermopilous and Sebaceous Cysts, or Wens, are formed by an involution of the skin, with a growth of hair on the inner wall of the sac. They may become imbedded deeply in the tissues subcutaneously, or may just penetrate the thickness of the skin, where they are movable and painless. They are generally found within the ear or at its base, although they may form on any part of the body. Usually they form a small opening, from which thick, cheesy matter can be squeezed out. The rational treatment is to dissect them out, using Davis Wire Cut Remedy and Phenalin as antiseptics after the operation.

**Scabies,
Acariasis,
Mange,**

or the Itch, is a disease of a local nature, due to a mite, which induces irritation on the surface of the body generally. It is always contagious, requiring for its development the transplantation of the parasites or their eggs from the diseased to the healthy animal. The disease is very common among cattle in America.

Treatment.—It is of the utmost importance to cleanse the skin, removing the crusts, etc., before the parasites can be effectually eradicated. For this purpose use soft soap and warm water, and give the animal a thorough scrubbing, especially in regions where the skin has been rubbed. Then use Phenalin or Davis Mange Cure, following the directions for its use given on the package. If you do not succeed in removing all the crusts by the first washing (with soap and water) apply sweet oil to soften them before you use the remedy. You may then wash them off the following day and apply Phenalin. If you do not have this remedy at hand you may substitute with the following: Creolin, 1 ounce; oil of tar, 1 ounce; soft soap, $\frac{1}{2}$ pint; sulphur, $\frac{1}{2}$ pound; alcohol, 1 pint. Wash it off in two days with soap and water. Three or four days later a second application should be made to destroy all remaining parasites. Cleanse and whitewash the stable and stalls where affected cattle have been put up. In cleansing, use Phenalin as an antiseptic and disinfectant. This treatment is intended for individual cases only. If you have a herd that becomes affected they should be dipped in vats.

Phthiriasis,

or Lousiness, is a skin disease common to cattle as well as other animals. The lice of cattle are of two kinds, the suctorial lice, which are found only upon mammals, and the biting lice, which attack mammals and fowls. Those belonging to the first named variety are the short nosed ox louse, and the long nosed ox louse, as they are popularly called. The short nosed ox louse is the larger and harder to exterminate. It infests almost exclusively the neck and shoulders and those parts are frequently worn bare by the animal in its efforts to rid itself of these tormentors. There is but one species of biting lice known to occur on cattle. The *Trichodectes scalaris*. This is very common to cattle. It is very distinct from the suctorial species in appearance, and this is readily recognized by all observers, for it is generally called the little red louse in contrast with the blue louse. They are also less injurious than the former.

Symptoms.—Lousiness generally becomes manifest in winter and toward spring, when the animal is found to rub the infested portions of the body, occasionally to such an extent as to produce excoriations of the skin. It becomes thin in flesh and debilitated. A close examination will reveal the true state, and prompt attention is advisable.

Treatment.—Davis Fly Chaser is the standard remedy for all afflictions of this nature. It should be used with a spray, applying a light coat and afterward covering the animal with a blanket to insure the death of all parasites. If this is not at hand the following is a good remedy: Make a decoction of *Cocculus indicus*—fish berries. Take $\frac{1}{2}$ pound for each animal, pound fine, then add 2 quarts of vinegar, and set it on the stove to simmer for an hour. Apply this thoroughly by rubbing it well into the hair over the infested region. This will not injure the skin nor sicken the animal, and it remains effective long enough to kill all the young lice as they are hatched from the nits.

**Astriasis—
Warbles,**

or grub in the skin, are characterized by tumors in the skin along the back and loins of cattle, which contain a grub deposited by the *Hypoderma bovis*, or gadfly. When the cattle are attacked by this fly it is easily known by the terror and agitation of the whole herd. The unfortunate object of the attack runs bellowing from among the herd to some distant part of the field or the nearest water. The tail, from the severity of the pain, is held with a tremulous motion straight from the body, and the head and neck are stretched to the utmost.

Treatment.—Whenever cattle have these tumors along the back in the winter it is advisable to enlarge the opening which already exists and press out the grub, or it may be caught with the point of a shoemaker's awl and extracted. Davis Wire Cut Remedy may then be applied, or Phenalin as an antiseptic is good.

**Flies and
Mosquitoes**

may become dangerous to cattle in sections where malignant anthrax prevails, as they may be carriers of poison from the diseased or dead animal to the healthy one. The tsetse fly (*Glossina morsitans*), of Africa, is very destructive to cattle, its sting causing death in many cases. Maggots hatched from the eggs deposited by flies upon wounds frequently are very annoying to the animal, and retard the healing process. The maggots from the screw worm (*Lucilia macellaaria*) burrow in wounds of the skin, and no time should be lost to get rid of them. The application of Davis Fly Chaser should be used to destroy the vermin; it will prove a positive remedy for this trouble.

**Ringworm—Tinea
Tonsurans and
Tinea Favosa.**

Ringworm is an affection of the skin due to a vegetable parasite. *Tinea tonsurans* is due to the presence of a minute or microscopic fungus, the *Trichophyton tonsurans*. It affects the hair and the epidermic layers of the skin, and is highly contagious, being readily transmitted from one animal to the other. It is a common disease among young cattle in the winter and spring, and is communicable to man. The disease becomes manifest by the formation of circular patches on the skin, which soon becomes denuded of hair.

Treatment.—Remove all crusts by washing with soap and water, then apply acetic acid, sulphur ointment, or nitrate of mercury ointment once a day. Use Davis Wire Cut Remedy and Phenalin as antiseptics; cleanse the stable, using Davis Stable Disinfectant as a disinfectant, and whitewash the walls in order to destroy the spores scattered by the crusts.

DISEASES OF THE FOOT.

Laminitis

denotes an active inflammation of the sensitive structures within the wall of the hoof, which may in severe cases result in suppuration, and the loss of one or more claws.

Causes.—It may be caused by overfeeding, overheating, or by driving long distances over rough and sandy soil.

Treatment.—Cold packs to the feet, or if the animal can be made to stand in a running stream of water, having a soft bottom, this will often relieve the inflammation without the necessity of any additional treatment. Give, however, a full dose of Epsom salts, 1 to 1½ pounds, followed by double feeds of Davis Stock Food two or three times daily.

**Soreness—
Foot Soreness**

may occur in cattle that are driven over stony roads, especially such as have been stabled or pastured on soft ground. Draft oxen, for this reason, require to be shod. When the soreness is excessive it may develop into an active inflammation of all the sensitive structures of the foot—laminitis.

Treatment.—Rest, poulticing the feet with moistened clay, followed by astringent washes, made of Davis Wire Cut Remedy, strong, white oak bark or alum water.

Loss of Hoof

is caused at times by cattle becoming fastened between planks or otherwise, pulling off the wall of one or both claws in the effort to extricate themselves. Again, the claws of one or more feet may be shed as the result of acute laminitis.

Treatment.—The best way is to apply a thick coating of Kentucky Foot Form or pine tar over the bleeding surface, then cover with a layer of oakum or absorbent cotton; apply another coat of tar over this, then bandage closely and firmly. This may remain without disturbance until the new wall becomes sufficiently strong to sustain the pressure and weight of the animal. But if pus should form under the dressing, indicating itself by oozing or bad smell, the bandage should be removed and as much of the suppurating surface dressed as may indicate any unhealthy condition. Before applying tar to the second dressing the foot should be soaked in a solution of chloride of zinc, 1 dram to 1 pint of water. This may have to be repeated every few days, continuing as long as there is any pus formation. If loss of hoof is due to laminitis, the parts denuded of its horny covering must be thoroughly cleansed and disinfected with the zinc solution. Then apply a moderately thick layer of absorbent cotton, and apply the tar and bandage over this. After this the zinc solution may be poured in at the top of the dressing daily, soaking and saturating the dressing and inflamed tissue. It may be necessary to remove the whole dressing once a week to give the parts a fresh cleansing, and then to reapply it. In all cases where it can be avoided, the first dressing should never be removed entirely, but holes made through it for the escape of pus.

**Foul in Foot
— Foot Rot**

occurs generally as an inflammation of the foot between the claws or toes, sometimes extending entirely around the bulb of the heels. It is never contagious among cattle like foot rot among sheep.

Treatment.—In the first stages of the disease, before pus burrows beneath the horn, a thorough cleansing and an application of Phenalin, clean stabling, laxative feed, adding Davis Stock Food to the ration always, in order that the digestive and circulatory functions may act healthily, will soon remedy the evil. If deep sloughing has taken place Phenalin should be used, and a wad of oakum or cotton smeared with pine tar should be secured firmly in the cleft. This can be done by taking a strip of cloth, 2 inches wide, passing the middle between the claws, then tying the ends after winding them in opposite directions above the hoof. Sometimes warm poulticing with oil cake meal, boiled carrots, or boiled mashed potatoes, becomes necessary to relieve excessive fever and pain. If pus burrows under the horn its channel must be followed by paring away the horn until the bottom is reached. After treatment to be the same as already recommended. If joint becomes affected an amputation of that toe will be the quickest and surest method to relieve suffering of the animal, and offers the best chance for an early recovery.

**Fissure of
the Wall,**

or Split Hoof, is rarely seen among cattle. It may occur in weak walls, in heavy bodied cattle, by stepping on an uneven surface, especially when the point of the toe is grown out long.

Treatment.—The divided sections may be brought into approximation and held in place by drilling a small hole from one side into and through the other, commencing $\frac{1}{2}$ -inch back of the fissure on each side; then drive a light horseshoe nail through the hole and clinch it. Pare the injured claw as short as it will bear and apply Kentucky Foot Form.

**Pricks and
Wounds,**

from prick, fork or nail, etc. If the wound be penetrating, enlarge the orifice to permit free discharge of pus; then apply flaxseed poultice, changing it three times a day until fever has abated. Keep animal on a clean floor until all lameness has disappeared. If an animal is cut in the foot with barbed wire, piece of glass, or any other substance, after proper cleansing, dress the wound with Davis Wire Cut Remedy. If any uneven edges of horn or skin or lacerated flesh project, trim them off, and in all cases where it can be done a tarred bandage should be applied. If the wound has extended into a joint, surgical treatment by a veterinarian may be necessary. Occasionally an animal becomes fastened by the foot in some crevice and sustains severe bruising, wrenching, or fracture of some part of the foot. In such cases use cold water packs until the fever and swelling disappear. Then let animal rest until usefulness of foot is restored. If complications do not arise this is all that is required in such cases.

DISEASES OF THE EYE.

Catarrhal Conjunctivities—Specific Ophthalmia, appears as a rule in an enzootic form, and affects quite a number in the herd. It is usually attributed to some irritant material carried in the atmosphere or emanating from the soil. It is most prevalent on low grounds, and rarely occurs during the winter months. It affects young and old animals alike.

Symptoms.—A mucopurulent discharge of the eyes; an intense degree of inflammation of the mucous membrane, accompanied by swelling of the eyelids and an early opacity of the cornea. Flow of tears is mixed with pus, sometimes streaked with blood, gathering in large masses on the cheek. Eyes are kept continually closed. The implication of the cornea in the disease frequently blinds the animal for a time. The attack from the outset is marked by high fever, loss of appetite, partial loss of milk, suspended rumination, and separation from the herd.

Treatment.—Among all the remedies experimented with, scientifically combined in our laboratories by expert chemists and put to the practical test among stock raisers throughout the country, the ingredients contained in the Davis Ophthalmia Specific we found to be the most effective, speedy and harmless. Hence we can honestly recommend this as a remedy par excellence for this serious and destructive disease among cattle, which often renders otherwise valuable and high priced animals practically worthless, except for the butcher. Under treatment the animal should be housed in a cool, dark stable, supplied with plenty of fresh water to drink and given soft, succulent feed, to which always add 1 or 2 tablespoonfuls of Davis Stock Food (1 tablespoonful in health and 2 in disease to each feed, is the regular proportion). Before using Davis Ophthalmia Specific administer 1 pound of Epsom salts (if a large animal, 1½ pounds) dissolved in 2 or 3 pints of water. If, for any reason, Davis Ophthalmia Specific should not be at hand, try tincture of veratrum given every two hours in 30-drop doses and ½ ounce of saltpeter three times a day. In the majority of cases improvement under the Davis Ophthalmia Specific becomes manifest in a few days, and the eye will become clear and free from inflammation in ten days or two weeks. In order, in so far as possible, to prevent this disease from spreading in a herd, all the unaffected animals should be moved to another locality; that is, to fields which possess a different character of soil and feed. The water should also be changed, especially if they have been obtaining their drinking water from a running stream or stagnant pond.

Keratitis— Corneitis,

is an inflammation of the cornea proper, more or less complicated. It is divided into diffuse and suppurative.

Causes.—The cornea constitutes the most prominent part of the eyeball, hence it is subject to a variety of injuries—scratches, pricks, contusions, lacerations, etc.

Symptoms.—Diffuse keratitis is characterized by an exudation into an opacity of the cornea. Swelling of the anterior part of the eyeball may be of an irregular form, in points resembling small bladders. If the whole cornea is affected it has a uniformly gray or grayish appearance. Both eyes usually become affected, unless it is due to an external injury. Suppurative keratitis may be a sequel of diffuse keratitis, but more commonly becomes manifest by a raised swelling on or near the center of the cornea, that very soon assumes a yellow, turbid color. Suppurative keratitis is seldom noticed for the first day or two; not until distinct pus formation has occurred. When the deeper membranes covering the anterior chamber of the eye become involved the contents of this chamber may be evacuated and the sight permanently lost.

Treatment.—Place animal in a darkened stable, give green or sloppy feed, with Davis Stock Food added, and administer 4 ounces of Glauber salts (sulphate of soda) dissolved in 1 quart of water once a day. If the animal is debilitated, double feeds of Davis Stock Food should be mixed with the feed three times a day. As an application for the eye, Davis Ophthalmia Specific may be used several times a day.

DISEASES OF THE EAR.

Abscesses

sometimes form about the base of the ear, either outside or inside, caused by contusions. A serous cyst is found occasionally between the cartilage and the skin on the base of the ear, which may be due to a similar cause.

Treatment.—Make a free incision with a knife into the most prominent part of the abscess or cyst, then wash out the sac with Phenalin or carbolized water, using a syringe for that purpose. If the abscess recurs, open it again, wash it out and inject Davis Wire Cut Remedy.

Foreign Bodies in the Ear.

Bugs may gain entrance into the ear of the animal. Pieces of wood, acorns, etc., have also been known to gain ingress. The presence of a foreign body in the ear may be known by uneasiness, continued or frequent shaking of the head, with occasional manifestations of great pain. Animal may rub its head or ear against trees or other objects in an endeavor to dislodge the offending body.

Treatment.—Careful examination will reveal the offending cause, which may be removed with a pair of forceps, or scraped out with a hairpin, or a piece of wire bent at one end. If much inflammation exists the ear may be swollen so that the foreign substance will be hidden from sight, then a probe may be inserted to feel the object, but this, however, had better be done by a skilled veterinarian and we advise you to secure the services of such in serious cases of this nature.

Frost Bite— Gelatio.

Poorly nourished young cattle, exposed to rough weather, storms and extreme cold, frequently suffer frost bite of the ear, which may amount to an actual freezing of the part.

Symptoms.—The trouble presents every degree of severity from the mere chilling of the tip of the ear to positive freezing to death of a portion. In a day or two after freezing has occurred the ear will become swollen and very painful; the dead part will remain cold and shrivel; a line of separation then forms between the inflamed and dead or dying portion, and finally the piece destroyed drops off, leaving a raw healing surface. When ear is only slightly affected an excoriation or peeling off of superficial skin takes place, accompanied by some pain and itching.

Treatment.—Davis Wire Cut Remedy is excellent for this trouble and will quickly heal the inflamed surface. If this is not at hand, a substitute may be prepared in a mixture of turpentine, ammonia and chloroform, of each 1 part, added to 6 parts of sweet oil. Rub this on the ear several times a day. It will relieve pain and stimulate circulation. The patient should be fed on a nourishing ration, to which Davis Stock Food is added in the usual proportion, and it will soon be able to withstand frost and wintry weather much better than was formerly the case.

Lacerations of the Ear.

Aggressive dogs are the most frequent cause of lacerated ear, generally leaving a torn, ragged edge and bruised cartilage.

Treatment.—If the wound is extensive a trimming of the ragged edges becomes necessary; then fasten the edges together with silver wire, catgut, or strong, thick linen thread, taking a deep hold. Apply Davis Wire Cut Remedy, or pine tar.

INFECTIOUS DISEASES OF CATTLE.

A general knowledge of the nature of infectious diseases among domestic animals is of the greatest importance to the farmer and stock raiser. Fresh animals are being continually introduced among his herd which may be carriers of disease from other herds, and when this is once introduced into a large herd the losses become severe, because it is difficult if not impossible to check a disease after it has once obtained foothold.

An infectious disease may be defined as any malady caused by the introduction into the body of minute organisms of a vegetable or animal nature which have the power of infinite multiplication and of setting free certain peculiar poisons which are chiefly responsible for the morbid changes. This definition includes diseases due to certain animal parasites, such as trichina, which multiply in the digestive tract, but whose progeny is limited to a single generation. Bacteria may be defined as very minute, unicellular organisms of a plant like character. The rapidity with which these multiply depends upon the nature of the bacterium. The bacillus of tuberculosis multiplies very slowly, while that of anthrax multiplies with great rapidity, both being in the most favorable condition. Nearly all the diseases of cattle, for which a definite cause has been traced, are due to bacteria. Among them rank prominently tuberculosis, anthrax, black quarter, and tetanus (or lockjaw). Only one, Texas fever, is traceable to protozoa, and one, actinomycosis, to a fungus. Those diseases of which the cause is unknown or imperfectly worked out are pleuropneumonia, rinderpest, foot and mouth disease, rabies, cow pox, malignant catarrh, and dysentery.

Infectious diseases have, as a general rule, a period of incubation which comprises the time elapsing between the infection and the actual appearance of the malady. This period varies with the disease. The most common symptom of this class is fever. The severity of the fever is measured by the temperature of the animal and this is readily and accurately ascertainable by the clinical thermometer. Other symptoms are variable and depend upon the particular organ or organs most implicated. Loss of appetite, cessation of rumination and milk secretion, and general dullness are symptoms quite invariably present in most infectious diseases. Secondary diseases or complications may arise during the course of infectious diseases which are largely due to bacteria other than those produced by the original malady. They may be so severe as to become fatal. In general it may be stated that they are due to filthy surroundings, and hence cleanliness may become important as an aid to recovery. Infectious diseases, as a rule, are not amenable to treatment. When the symptoms have once appeared the disease is apt to run its course in spite of treatment, and if it is one from which animals usually recover, all that can be done is to put them into the most favorable surroundings. Many infectious diseases lead sooner or later to death, and treatment is useless so far as the sick are concerned. But it may be worse than useless for those not yet infected. All animals suffering from infectious diseases are a menace to all others more or less directly. They may infect others directly or they may scatter the virus about so that the surroundings become a future source of infection for healthy animals. This leads to the oft repeated maxim that an ounce of prevention is worth a pound of cure—in fact, is the only remedy here:

Keep disease away from your herd and farm. Avoid all sick and suspicious animals. A grave form of disease may be introduced by apparently mild or trivial cases brought in from without. Continued change and movement of animals are the most potent means by which infectious diseases are spread.

With some cattle diseases, such as anthrax, black quarter, and pleuropneumonia, preventive inoculation is resorted to in some countries. This may be desirable when certain diseases have become stationary in any locality, so that eradication is impossible. It should not be practiced in territories

where a given disease may still be extirpated by ordinary precautions. When an infectious disease has gained foothold in a herd the course to be pursued in getting rid of it will depend upon the nature of the malady. A good rule is to kill diseased animals, especially when the disease is likely to run a chronic course, such as tuberculosis. Next in importance is to separate the sick from the well, by placing the latter on fresh ground. This is rarely possible, hence the destruction and removal of the sick, with thorough disinfection of the infected locality is the next thing to be done. Disinfection consists in the use of certain substances in solution which destroy bacteria or their spores, or both. Those which are cheapest and most available for animal diseases are ordinary freshly slaked lime or unslaked in powder, Phenalin, chlorate of lime, and mercuric chloride or corrosive sublimate.

Slaked lime is perhaps the most easily procured, but its disinfecting power is limited. While it is capable of destroying all bacteria in their vegetative state, it is unable to destroy spores such as those of anthrax and black quarter. It is probable, however, that in incrusting spores it may destroy them sooner or later. It is regarded as safe practice to use only spore destroying substances for the virus of those diseases of which we have no absolute knowledge. Nevertheless, in the absence of other disinfectants, lime is very useful. It may be employed as a whitewash on wood or stone and sprinkled as a dilute wash or in powder over yards, manure heaps, and over carcasses before they are buried and over the ground on which they have lain. Chloride of lime is more efficient than simple slaked or unslaked lime, since it destroys spores. A 5 per cent solution is sufficiently strong for all spore bearing bacteria (3 ounces in 2 quarts of water). Davis Stable Disinfectant takes the place of the more costly carbolic acid disinfectants and is absolutely safe. It should be applied freely on woodwork and on infected floors. In most cases where its application becomes desirable—and this rule should apply to all disinfectants—the disinfected stables, stalls, etc., should remain vacant as long as possible before cattle are again put in. Mercuric chloride or corrosive sublimate is a powerful disinfectant, but it is likewise very poisonous, hence its uses are limited. A solution of one-tenth per cent is usually sufficient (1 ounce to 15 gallons of water). It is corrosive and hence metal pails and dishes are to be avoided. All solutions should be labeled poison, and to avoid accident none should be kept on hand. In addition to these artificial substances there are several natural sanitary agents of great importance as destroyers of virus. These are cleanliness, ventilation, drying and sunshine. All virus excepting such as may live in the soil are killed sooner or later by drying and sunshine, hence the importance of these factors in the life and well being of your animals, as well as yourself and your family, cannot be overestimated. That all sanitary measures which contribute to the healthfulness of animal surroundings are directly or indirectly inimical to disease germ is self evident, and all carelessness in the keeping of animals may be regarded as an ally of these destructive organisms.

As this disease has been eradicated from the United States, and it is improbable that it ever will appear here again, a brief mention of it will suffice. It is a contagious disease, and, on the American continent at least, it only arises by contagion from a previously affected animal. Hence it is never seen here except as the result of importing affected animals from the old world. When thoroughly stamped out it does not reappear, and if imported animals continue to be properly inspected and quarantined we have every reason to believe that pleuropneumonia will never again be seen affecting cattle of this country. The specific cause of the disease is not known.

Symptoms are similar to those that go with ordinary inflammation of the lungs and the pleura. If the attack is an acute one, as is frequently seen in hot weather, the symptoms appear suddenly, the breathing becomes rapid and difficult, the animal grunts or moans with each expiration, the shoulders stand out from the chest, the head is extended on the neck, the back is arched, the temperature is 104 to 107 degrees Fahrenheit, the milk secretion is suspended, there is no appetite, rumination is stopped, the animal may bloat and later become affected with severe diarrhea. Such cases are generally fatal in from seven to twenty days. Frequently, however, the attack comes on more slowly and the symptoms are less clear. In the milder cases there is a cough for a week or two, but no appreciable loss of appetite or elevation of temperature. The lungs are but slightly affected, and recovery soon follows. Such animals may disseminate the disease for a long time without being suspected, and for that

Contagious Pleuropneumonia.

reason are the most dangerous of all. And there is a more severe type of the plague in which all the symptoms described are enhanced. Seriously affected animals remain standing, if they have sufficient strength, but those which lie down always lie on the affected side. The proportion of animals which become affected after being exposed varies according to the virulence of the outbreak, the susceptibility of the animals and the length of time during which exposure is continued. Sometimes not over 15, 20, or 30 per cent will contract the disease when a large herd is exposed; but, on the other hand, 80 or 90 per cent may be affected. In general it may be said that about 40 per cent of the exposed animals will contract the disease and about one-half of these cases will prove fatal.

Post Mortem Appearance.—If you suspect that by any means your herd may have become affected with this virulent disease, you may act as your own veterinarian, and by killing an affected animal you will, if the disease is pleuropneumonia, in examining the cavity of the chest and lungs, find the following symptoms:

The thorax may contain more or less serum, which may be clear or clouded. There may be firm adhesions of different parts of the lungs to the chest wall, the extent of which depends on the stage and severity of the disease. The diseased lobes are unusually large and exceedingly firm to the touch. The weight of a single large lobe may reach 40 pounds. Usually only one side is affected, often but a single lobe, and this most commonly the large or principal lobe. The pleura may be covered with one or more layers of a firm, elastic, grayish membrane, which varies in thickness and which sometimes may be pulled away entirely. Sometimes it is absent.

Prevention and Treatment.—Keep the animals so that they will not be exposed to contagion of any kind. As the disease only arises by contagion, there is no possibility of an animal becoming affected with it unless it has been exposed. If, therefore, pleuropneumonia exists in a locality, the owner of healthy cattle should make every effort to keep his animals from coming near those which are infected, and should also be particular not to allow any person who has been on the affected premises to visit his own pastures, stables, or cattle. If pleuropneumonia breaks out in a herd every animal in that herd should be slaughtered, the stables should be thoroughly cleansed and disinfected, and no other cattle should be allowed on the premises until a period of ninety days has elapsed. Medical treatment of affected cattle is unavailing. Therefore destroy the animal if affected, no matter how valuable it was before its infection. This is the best policy as well for the individual as for the community. As the disease happily is now extinct in America, previously mentioned, we do not consider it necessary to further enlarge upon the subject. Remember, the only possible way for the disease to occur in your herd is by the introduction of strange animals, carrying the disease with them from abroad, or infected by cattle coming from abroad.

Rinderpest,

also known as cattle plague, is an acute, infectious disease of cattle in which the digestive organs are mainly involved. It is unknown in this country, but nevertheless a few definite facts concerning this disease, should it ever reach our shores, may not prove in vain. It must not be forgotten, on the other hand, that a superficial knowledge of diseases, such as the layman may gain through reading, not infrequently leads to confounding comparatively harmless, non-infectious diseases with such as are truly dangerous, causing temporary panic among stock owners. It is well to bear this in mind, and not be unduly alarmed.

Rinderpest has its home in the territories around the Black Sea and the Volga River, in Russia, (some say in Central Asia). From there it at various times has been conveyed to the countries of Western Europe. The virus is conveyed from one country to another chiefly by means of infected cattle. In the past Rinderpest has been supposed identical with various human diseases, among them small pox and typhoid fever. This supposition is unfounded.

Causes.—Micro-organisms—most likely bacteria. The exact cause has not been determined. Virus may be transmitted from sick to healthy animals, both direct and indirect, in the usual ways—through manure, saliva, urine, etc. It retains its vitality outside the body in a moist state for months, even a year or more. Persons may carry the virus on their clothing, shoes, and implements. Rats, cats, etc., may act as carriers of the virus. It is claimed that animals after passing through one attack are able to resist successfully future attacks. Inoculation with virus is said to produce immunity, but the process of inoculation itself is followed with death in many cases.

Symptoms are not very pronounced. The time elapsing between the exposure to infection and the earliest outward symptoms varies from three to nine days. Then the first sign is high fever temperature, which may reach 107 degrees Fahrenheit. Heat of the skin varies in different parts of the body, and may be felt at the base of the ears and horns. There are repeated chills. Pulse reaches 50 to 60 beats per minute, and may arise to 90 or 100 in very severe attacks. Animal is greatly debilitated; ears droop; coat is staring; muzzle dry; secretion of milk diminishes rapidly; back is arched and the four limbs brought together under the body. As the disease progresses symptoms in reference to the digestive and respiratory organs become prominent. The membranes of the mouth, nose, rectum and vagina become reddened either in patches or diffusely and assume a scarlet hue. The discharges, at first firm, become softer and soon diarrhea sets in. Rectum may become everted and paralyzed, and the bowels move spontaneously. Coughing is a common symptom. It is associated with discharges from the nose and vagina, and dribbling of saliva from the mouth. The discharges from the bowels may be streaked with blood. Eyes also become affected; an increased formation of a viscid secretion flows down the face. After death, if the animal be opened and the organs carefully examined, the chief changes will be found in the digestive organs. The lining membrane of the mouth and pharynx is covered with mucus, is reddened in spots, and shows superficial yellowish gray, cheesy patches which represent dead tissue and when removed expose ulcerated depressions. The same condition is found in the fourth stomach, the small intestines, the nasal cavity, the uterus, vagina and rectum. Neither treatment nor inoculation is permitted in European countries.

Foot and Mouth Disease is an acute, highly contagious fever of a specific nature, characterized by the eruption of blisters or vesicles in the mouth, around the coronets of the feet, and between the toes. Cattle and swine are attacked with equal facility, while sheep and goats are less susceptible. Horses, dogs, cats and fowls are rarely attacked. Human beings may become infected by drinking the unboiled milk from animals suffering from the disease. In such cases the symptoms resemble those observed in animals. There is fever and difficulty in swallowing, followed by an eruption of blisters in the mouth and very rarely by similar ones on the fingers. Disease is seldom fatal, in the human chiefly restricted to children, and adults who handle sick animals or drink large quantities of unboiled milk. In European countries it occasions great losses to the live stock industry. It may attack the same animal repeatedly. The source of the malady has not been accurately determined. The infection is contained in the eruptions, and hence shed from the mouth and feet. A wide distribution of the virus and a rapid infection of the herd is the result. Animals may be infected directly by coming in contact with the diseased, or they may be exposed to the virus in stables, in the field and along the roads, etc. Human beings may carry the virus on their clothing and transmit it on their hands when milking, since the udder is occasionally the seat of the eruption. Milk in a raw state may also transmit the disease to other animals.

Symptoms.—After a period of incubation, lasting not more than five days, and sometimes no longer than two, the disease begins with a fever. Temperature as a rule does not rise above 104 degrees Fahrenheit. Lining membrane of the mouth becomes reddened; appetite diminished; rumination ceases; mouth is usually kept closed and the quantity of saliva increases; a smacking sound is not infrequently made by the animal. After two or three days the eruption appears, consisting of small, yellowish white vesicles or blisters, about as large as a hemp seed or a pea, on the gums and inner surface of the lips, the inside of the cheeks, the border and under the surface of the tongue. They may become $\frac{1}{2}$ inch in diameter. The disease may attack the udder in cows, more particularly the teats. The vesicles are broken as they appear by the hands of the milker, and the teats become covered with reddened spots deprived of the superficial layer of skin, and are very tender. As the result of the general affection young calves may succumb to a secondary inflammation of the stomach and bowels, and older animals may abort or suffer from inflammation of the udder.

Treatment.—Endeavor to put animal in best condition possible by allowing it a nourishing ration, to which add Davis Stock Food, 2 to 4 tablespoonfuls to each feed. Let the bedding be light and dry, frequently changed to prevent injury to the feet. Do not let animal stand upon a hard or rough floor. To relieve the irritation in the mouth, use borax, 1 ounce in 3 pints of water; water containing

vinegar and salt; alum, 1 ounce in 1 quart of water. Apply with a syringe or pour from a bottle, or devise an irrigator by attaching a funnel to a rubber tube. Use injections once or twice a day, about $\frac{1}{2}$ pint being injected each time. The blisters should not be opened. For the feet, as a rule, nothing but clean bedding and antiseptic washing with Phenalin and tepid water once daily is required. For the affection of the teats simple glycerine or glycerine containing $\frac{1}{4}$ dram of boracic acid to the ounce may be applied several times a day; or zinc ointment containing preferably 30 drops of the tincture of opium to the ounce. Care should be taken to draw the milk at proper intervals.

Vesicular Eruption of the Genital Organs.

A contagious disease, not known in America but more or less prevalent on the Continent. It may be defined as a highly contagious eruption situated upon the genital organs of both sexes, and accompanied with little or no general disturbance of health. The contagion is transmitted mainly during copulation. In cows the mucous membrane of the vagina and the vulva become swollen, reddened and very tender. The secretion is very abundant and consists at first largely of serum and mucus. Small vesicles then appear which rapidly burst and are converted into excoriations or deeper ulcerations. The secretion becomes more purulent, and is apt to dry in crusts about the tail. The disease lasts from two to four weeks, and always terminates in recovery. Treatment need not be resorted to except in severe cases. An antiseptic wash of Phenalin may, however, be used with advantage. Care should be taken not to carry the disease from the sick animals to the well ones by sponges, etc., which have come in contact with the affected organs. These should be destroyed. Isolate affected animals until recovery takes place.

Tuberculosis

is an infectious disease, characterized by the formation in various organs of the body of minute nodules or tubercles which contain the bacillus tuberculosis, the cause of the disease.

Causes.—The cause of the disease may be considered twofold, the tubercle bacillus first and foremost, without which this disease never could develop, and certain predisposing causes which prepare the way for it. The ways in which the tubercle bacilli find their way into the body may be considered under four heads, according to their importance: (1) By inhalation into the lungs; (2) into the digestive tract in the milk of tuberculous cows; (3) during coition, when the sexual organs are tuberculous; (4) from the tuberculous mother to the fetus in the uterus. Inhalation is by far the most common mode of infection. The bacilli can get into the lungs only when inhaled. They must therefore be thoroughly dried and pulverized before currents of air can carry them. The bacilli will withstand drying for months before they lose their power of producing disease. They leave the bodies of diseased animals in several ways. There may be a little discharge occasionally coughed up from the diseased lungs, or milk may be spilt, or there may be a discharge from the vagina when the genital organs are tuberculous. The bacilli from these sources may be dried and pulverized and carried in the air of the stable and into the lungs of still healthy cattle, where the disease then develops.

The disease of the stomach, intestines, etc., is very probably the result of feed infection. Tubercle bacilli may become scattered upon the feed by diseased animals. But the most common cause of such infection is the milk of tuberculous cows. Calves may become infected in this way. The disease may remain latent until the animal becomes older. The not infrequent occurrence of tuberculosis of the uterus and ovaries makes it probable that the disease may be transmitted by a diseased bull and carried by a healthy bull from a diseased cow to a number of healthy cows. The source of the infection is always some previous case, for the disease can never arise spontaneously. Hence, in those stables in which there is a frequent change of cattle, the introduction of tuberculosis by cattle coming from other infected stables is the most frequent source of infection. Since the bacilli when dried can be carried by the air it is not necessary that healthy animals should come in direct contact with cases of disease to become infected.

Unsanitary conditions, such as overcrowding in poorly ventilated and poorly lighted stables, and feeding feed which is not nutritious are among the causes which contribute to the spread of the disease. Conditions which injure the lungs are favorable to the development of the disease. Among them are inhalation of dust and smoke, all conditions which may induce catarrhal inflammation of the bronchial tubes, etc. Other causes are overproduction of milk; too many births; the improvement of

stock by continual inbreeding, and the consequent inheritance of certain constitutional characters of a debilitating nature. Animals living in the lowlands are more subject to this disease than the more robust races living in elevated mountain regions. Animals on open pasture are less susceptible than stabled animals. The disease is far more common in cows than in oxen, owing to the strain to which bringing forth young and milking subject the females. Animals subjected to special feeding, such as cows in distilleries, breweries and other manufactories having waste available as feed, are the most susceptible to the disease.

Symptoms.—The beginning of the disease usually passes unnoticed, inasmuch as it is very slow and insidious and rarely accompanied by fever. When the lungs are involved a dull, short cough is noticed, which may later on become prolonged, convulsive and very troublesome to the animal. Cough is more frequent in the morning after drinking. The breathing varies. Only when much of the lung tissue is involved, is it labored and accompanied by active movements of the chest and nostrils. Discharge from the nostrils is rare or absent. At times, however, when the tubercles have broken down and cavities containing cheesy matter form in the lungs, or when the air tubes have become filled with cheesy and mucous masses, coughing will dislodge these and cause their discharge. In advanced stages the breath may have a disagreeable odor. Pressure on the chest wall may give rise to pain. The general effect on the body is at first slight. But as the disease progresses, loss of flesh and appetite and paleness of the mucous membranes become manifest. Gradually the milk secretion diminishes; coat is staring and tough; skin dry and harsh (hide bound); digestive disturbances are indicated by tympanitis or distention of the rumen by gas, colic or diarrhea, alternating with constipation. The animal generally dies from the disease after a period of sickness which may last months or years. Tuberculosis in the abdominal organs is often signalized by abortion and by abnormal sexual manifestations. When the brain is involved the disease may cause convulsions, unconsciousness, paralysis, as well as peculiar movements in a circle, oblique position of the head, etc. Here is a pretty accurate condensed description of the symptoms most peculiar to the disease, as formulated by a Swiss authority:

A dry, short, interrupted, hoarse cough, especially in the morning at feeding time, or after violent exertion. Animals at first may be full blooded and lay on considerable fat when well fed. As disease progresses they grow thin, showing symptoms peculiar to malnutrition, such as staring, lusterless, disheveled coat; dirty, tense skin, which appears very pale in those regions free from hair. The temperature of the skin is below normal. The loss of fat causes sinking of the eyes in their sockets. They appear swimming in water, and their expression is weak. Cough is more frequent, but rarely accompanied with discharge. Body continues to emaciate even with plenty of feed and a good appetite, so that the quantity of milk is small. Often the animals express considerable tenderness when pressure is applied to the sides or front of the chest, by coughing, moaning, etc.

Treatment.—Treatment of the disease is not seriously considered by any authorities at the present time. Preventive measures, and measures for preventing the spread of the disease in the herd once it has made its appearance, are all that can be recommended. How the spread of the bacilli takes place has already been enlarged upon, and all those conditions should be carefully guarded against. The difficulty of determining when cattle first become tuberculous makes it impossible to prevent the possibility of infection. Great care should be bestowed upon the breeding, the surroundings, and the feed of the animal, so that the latter may be put into condition to resist infection even when exposed to it. In connection with a nourishing, succulent ration the digestive powers, assimilation and circulation should be kept up to a high degree of perfection, and this can be done by including Davis Stock Food, 2 tablespoonfuls to each feed with the ration. This, in fact, is a practical safeguard against almost all the diseases, infectious and otherwise, of the bovine race, and the small cost will be made up manifold to the prudent and foreseeing breeder by the insurance against disease in his herd it affords and the fine condition he is able to keep his animals in. A rigid exclusion of tuberculous animals, if this were possible, would of course, be of great assistance, but, on account of the uncertain symptoms in the first stages of the disease, it is not quite possible to carry this into effect at the present time.

Tuberculosis in cattle may also be considered as bearing upon tuberculosis of other domesticated animals, particularly the swine. In Europe the disease is not uncommon among swine, while in America

it is practically unknown. The reason for its existence in Europe may be looked for in the feeding of pigs with whey in dairies, with the offals of the abbatoirs and the household refuse generally.

The carcasses of animals which have died from tuberculosis should be deeply buried, so that they cannot be eaten by other animals. This is likewise true of all organs and tissues of slaughtered animals containing tubercles. These should never be fed to other animals, such as swine, dogs and cats, and should either be destroyed by fire or deeply buried.

Bovine Tuberculosis; Its Dangers to Man.—The identity of human and animal tuberculosis, combined with the extraordinary mortality of human beings from the disease, often amounting to from 10 to 14 per cent, has raised the question in all civilized countries as to how far animal, and especially bovine tuberculosis was to blame for this high mortality. If the disease is transmitted to man, how does the transmission take place? The question may be resolved into two divisions: (1) How frequently does the disease invade those parts of the body that are used for food? (2) When the disease process is manifestly restricted to the internal organs do tubercle bacilli circulate in the blood and lymph, and lying near can they be detected in the muscular tissue?

(1).—Disease of the bones is not unknown, although very rare. It appears chiefly in the spongy bones of the head and backbone and in the long bones of the limbs. Occasionally the ends of the bones, where they are covered with the synovial membrane of the joints, are dotted with tubercles. The muscular system itself is very rarely the seat of tuberculous deposits, although the lymphatic glands and among the muscles may be not infrequently diseased.

(2).—Whether tubercle bacilli are found in muscle juice independent of any tubercular deposits is a question which must be approached experimentally. Experiments have shown that in rare cases the flesh of tuberculous cattle contains a small number of tubercle bacilli. In Germany the flesh of animals in which the disease is just beginning, or in which it is restricted to one or more related organs, is not rejected. When, however, the disease has affected the muscles, or bones, or lymphatic glands situated on or between them, the flesh is condemned as unfit and dangerous. Animals are also rejected in which it is evident from the general distribution of tubercles throughout the various organs, that the bacilli have been distributed by the blood and may have been carried into the muscular system (generalized tuberculosis.)

Infectious Nature of Milk.—In regard to the infectious nature of milk secreted by tuberculous cows, it is demonstrated that when the udder is in the slightest degree involved the milk possesses infectious properties, and is therefore dangerous. Tubercle bacilli have been found in large numbers in the milk and udder under such circumstances. Unlike other affections of the udder, tuberculosis of this organ does not at once change the appearance and quality of the milk secreted. Over a month after the disease has appeared the milk is often normal in appearance, and may be consumed and sold without arousing the suspicion of the owner. There is therefore great danger in this disease, and the necessity of careful inspection of dairy cows seems more urgent than before. Authorities are, however, not agreed as to whether the milk from tuberculous cows in which the udder is apparently not invaded should be considered dangerous or not. Some are inclined to believe that the milk from healthy udders is never infectious, even when the lungs and other organs are involved; that, in other words, the tubercle bacilli are rarely if ever separated from the lesions which they produce, and that the udder itself must be diseased before tubercle bacilli can appear in the milk. Experiments made with milk of tuberculous cows in which there were no indications of udder disease do not bear out this theory, since tubercle bacilli have been found in the milk of such cows. In spite of this, some authorities uphold the former theory. However this may be, we know that the milk of tuberculous cows may or may not contain tubercle bacilli when the udder is apparently free from disease, and we have no rapid method of determining whether in any given case the milk contains tubercle bacilli or not. Moreover, the bacilli may be absent at one time and present at another in milk from the same cow. When we then take into consideration the extent of tuberculosis and the hidden character of the scourge, we must admit that a certain amount of suspicion rests upon all milk. Fortunately, the tubercle bacilli are readily destroyed by the temperature of boiling water, and hence both milk and meat are made entirely safe, the former by the various processes of cooking, the latter by boiling for a few moments. Until better means for diagnosis are at

hand it is incumbent upon all communities to have dairy cows examined or inspected at least to the extent of finding out whether the udder shows any signs of disease. If this is detected the animal should be at once killed, or else all opportunity for sale of such milk removed by appropriate measures. The danger from infected milk might by these means be materially lessened.

Anthrax is an infectious disease, caused by a specific bacteria, known as anthrax bacilli, and which is more or less restricted by conditions of soil and moisture to definite localities. It is chiefly limited to cattle and sheep. It is a world wide disease and in America is chiefly confined to the lower Mississippi Valley. On tracts subject to inundations in spring, followed by a very hot and dry summer, severe outbreaks are apt to occur. The particular kinds of soil upon which the disease is observed are black, loose, warm, humus, also such as contain lime, marl and clay, finally peaty, swampy soils resting upon strata which hold the water. Hence fields containing stagnant pools may be the source of infection. The infection may be limited to certain farms, or even restricted areas on such farms. Another source of the virus, and one regarded as perhaps the most important, are the bodies of animals which have died from anthrax. In such bodies the anthrax bacilli are present in enormous numbers, and animals grazing or frequenting the spots where they lie easily become infected. They should be deeply buried at once upon death. The spores of the anthrax bacilli may be taken into the body with the feed, producing disease which commences in the intestinal tract; or they may come in contact with scratches, bites and other wounds of the skin, the mouth and the tongue, producing swellings or carbuncles. From such swellings the bacilli penetrate into the blood and produce general disease. Insects may also transmit the disease, it has been claimed.

Symptoms vary considerably in cattle, according as the disease begins in the skin, in the lungs or in the intestines. There are three forms of the disease: Anthrax peractus or apoplectiform, when the animal dies very suddenly as if from apoplexy, usually occurring in the first stage of the disease; anthrax acutus, without any external swellings, which is the one most commonly observed in cattle, and anthrax subacutus, including those cases which are most prolonged. The disease begins with high fever. The temperature may reach 106 to 107 degrees Fahrenheit. The pulse beats from 80 to 100 per minute. Feeding and rumination are suspended. Other symptoms are chills and muscular tremors; ears and base of horns may be cold; coat staring; animals are dull and stupid and manifest great weakness; dullness may give way to uneasiness, champing of the jaws, spasms of the limbs, kicking and pawing the ground; dilating nostrils, open mouth, head raised and all the muscles of the chest strained during breathing; visible mucous membranes (nose, mouth, rectum and vagina), become bluish. If disease has started in the bowels there is much pain, as shown by the moaning of the animal; discharge at first becomes softer and covered with serum, mucus and blood. As the disease approaches the fatal termination the weakness of the animal increases. It leans against supports or lies down. There may be rupture of blood vessels, with bloody discharges from the nose, mouth, rectum and vagina. Urine not unfrequently contains blood (red water). Death ensues within one or two days. The bodies of cattle which have died from anthrax soon lose their rigidity and become bloated, because decomposition sets in very rapidly.

Treatment as a rule is ineffectual and useless, excepting perhaps in cases which originate from external wounds. The swellings should be freely opened by long incisions with a sharp knife and washed daily several times with Phenalin. When suppuration has set in, the treatment contained in the chapter on wounds should be resorted to. In order to prevent the disease the state or nation ought to do its share in preventing frequent inundation by appropriate engineering on low, marshy soils. Fence off pools of stagnant water; have low, swampy lands properly drained; dispose of carcasses of animals which have died of anthrax immediately, burying them deeply where they cannot be exposed by dogs or wild animals. Remove them if possible to unfrequented places. The ground and all objects with which they have come in contact should be disinfected with Davis Stable Disinfectant or chloride of lime. For washing utensils, etc., a 5 per cent solution may be prepared by adding 3 ounces to 2 quarts of water. Prepare fresh from the powder and have a small tin measure of known capacity to dip out the powder to be added to the water whenever necessary. The carcass and ground should be sprinkled with powdered chloride, or slaked or unslaked lime if the first is not at hand. When stables have become infected they

should be thoroughly cleaned out, and chloride of lime freely applied to the floors and woodwork. The feed should be carefully protected from contamination with the manure or other discharge from the sick. Protective inoculation, according to the Pasteur method, is used against the disease in France and some European countries with a moderate amount of success. It is fraught with danger of distributing the bacilli through the vaccine or culture liquid.

Anthrax in Man.

In handling the carcasses and hides of animals which have succumbed to the disease, it may be transmitted to man. Infection usually takes place through some abrasion or slight wound of the skin into which the bacilli find their way. The point of inoculation first appears as a dark point or patch, compared by some writers to the sting of a flea. After a few hours this is changed into a reddened pimple which bears on its summit, usually around a hair, a yellowish blister or vesicle which later on becomes red or bluish in color. The burning sensation in this stage is very great. Later pimple enlarges, its center becomes dry, gangrenous, and surrounded by an elevated discolored swelling. Center becomes drier, more leather like, sinking in as the whole increases in size. Skin around the swelling or carbuncle is stained yellow or bluish, not infrequently swollen and doughy to the touch. Size of the carbuncle itself is that of a pea or small nut and is slightly painful. These carbuncles or swellings may lead sooner or later to infection of the whole body, thus becoming fatal, and surgical assistance should at once be called if there is a well grounded suspicion that inoculation has taken place through anthrax virus. The transmission of anthrax from cattle to man is by no means uncommon.

Blackleg.

Symptoms.—The symptoms of blackleg are so characteristic that the disease is easily recognized. The first symptoms may be either of a general or of a local nature, though more frequently of the latter. The general symptoms are high fever, loss of appetite, and suspension of rumination, followed by great depression. Respiration becomes accelerated; the animal moves around with difficulty, frequently lies down, and, when water is near at hand, drinks at short intervals and but a little at a time. The visible mucous membranes are at first dark red and congested, but they change in the course of twelve hours to a dirty, leaden or purplish color.

The most important diagnostic feature is the development of a tumor or swelling under the skin. The swelling may appear on any part of the body and limbs, except below the knee or hock joint or on the tail. It is frequently seen on the thigh or shoulder, and, owing to the extensive discoloration of the swollen parts, as observed after the animal has been skinned, the disease has been popularly named blackleg, or black quarter. Tumors may also appear on the neck, the chest, the flank, or the rump. At first they are small and very painful. They increase rapidly in size and may in a few hours cover a large portion of the body. One or more of these tumors may form simultaneously, and when in close proximity to one another may become confluent. The neighboring lymph glands become considerably swollen.

As to the location of the tumors, there seems to be a decided preference for the right side of the body. According to M. Hess, who has made observations along this line in 1,547 cases, the tumors appeared in 209 cases on the right hind quarter and in only 143 cases on the left; in 168 cases on the right front leg and in 98 on the left; in 59 cases on the right side of the neck and in 4 only on the left side. No explanation is offered for this peculiar preference for the right side, and as no observations have been made in this country, and the question is of small economic importance, the writer will not venture to express an opinion.

If slight pressure is made on the tumor a crackling sound is heard and percussion gives a clear resonant tone, due to the collection of gas in the affected tissue. The tumor is cool to the touch and painless in the center; the skin over it is dry and parchment like. When the tumor is lanced a frothy dark red fluid is discharged. If the incision is made while the animal is alive or immediately after death, there is no offensive odor to the discharge, but decomposition takes place very soon after death. No pain is manifested when the center of the tumor is lanced, but as soon as the knife reaches the warm, inflamed part the animal will bellow loudly and flinch. The swellings usually appear before the general symptoms, and they may even reach such an extent as to cause complete paralysis of the affected parts while the animal still looks bright and has a good appetite. This condition is, however, of short duration.

As the swelling increases in size the general symptoms become more intense. The temperature may reach 107 degrees Fahrenheit, while the respirations may reach 140 per minute. The animal is unable to rise; the extremities become cold, and some time before death the temperature falls and may become subnormal. There is trembling of the muscles, which, as death approaches, may develop into violent convulsions. With very few exceptions the disease terminates fatally, death generally occurring from twelve to thirty-six hours after the first appearance of the symptoms. A few cases linger from three to four days, and, as will be discussed later, the disease may sometimes terminate in recovery.

Appearance After Death.—The carcass of an animal which has died from blackleg soon becomes very distended with gas, partially through fermentation in the intestines and partially through the formation of gas in the subcutaneous tissue, due to the presence of the blackleg bacillus. This distention, which is especially pronounced in the region of the blackleg tumors, extends for a considerable distance from the tumors and in the directions where it meets the least resistance, that is, where there is plenty of loose areolar tissue. This is especially the case on the back and sides of the chest, on the shoulder and between the shoulder and chest, and on the external surface of the hind quarter. This tympanitic condition frequently causes the two legs on the upper side of the carcass to stand out straight without touching the ground.

A dark, blood colored, frothy discharge flows from the nostrils and the anus. Decomposition takes place soon after death, except in the affected muscles, which retain their sweetish sour odor without developing any putrid odor, even when the rest of the carcass has decomposed.

On the surface of the body may be seen one or more of the characteristic emphysematous blackleg tumors. The skin covering these swellings is affected with dry gangrene. The connective tissue beneath the skin is infiltrated with blood and bloody serum and is distended with gas. The distended muscles are dark brown or black, are easily torn, and the space surrounding them is filled with bloody liquid and gas. The muscle tissue is distended with numerous smaller or larger gas filled cavities, often to such an extent as to produce a resemblance to lung tissue. Upon incision it does not collapse perceptibly, as the gas cavities are not connected with each other. The discoloration is deepest at the center, shading off toward the edges, and becomes brighter by contact with air. On compression thick blood escapes, which is charged with gas and has a disagreeable, sour odor. The blood in the remaining parts of the carcass is normal and coagulates easily after death, forming a solid clot. The gas of the tumor is combustible and burns with a blue flame, being, according to Bollinger, carbureted hydrogen. The abdominal cavity sometimes contains a considerable quantity of bloody effusion. The mucous membrane of the intestine may be congested or inflamed, and the contents of the bowels may be covered with blood. The liver is congested, but the spleen is always normal.

It is often desirable to determine whether an animal is affected with blackleg or with anthrax tumor or with a swelling caused by the bacillus or malignant edema. The anthrax tumor may be distinguished by its hardness and solidity and by the fact that it contains no gas. The spleen is enlarged in anthrax and is unaffected in blackleg. The blood in anthrax is very dark and of a tar like consistency, while it is normal in blackleg. It is difficult to distinguish between the swellings of blackleg and malignant edema, since they resemble each other very closely and both are distended with gas. Malignant edema, however, generally starts from a wound of considerable size; it often follows surgical operations, and does not usually result from the small abrasions and pricks to which animals are subjected in pastures.

Manner of Infection.—As already mentioned, the blackleg bacillus gains entrance to the body through abrasions of the skin, and perhaps in rare cases through the mucous membrane. In order to meet the requirements for the development of the spores, that is, an absolute absence of hydrogen, it is necessary that the abrasion be minute in size and sufficiently deep to penetrate through the skin into the subcutaneous tissue; consequently incised or open wounds are not favorable to the development of blackleg, even if the infection is present in abundance. Punctured wounds, such as those received from barbed wire fences or from stubbles and briars in the pasture, seem to be the most likely method of infection and correspond most closely to the only manner in which the disease may be produced artificially, that is, through hypodermic injection of the virus. It is doubtful whether the infection ever takes place through ingestion. In any case, it has proved exceedingly difficult to produce the disease, even by feeding enormous doses of highly virulent material to susceptible animals.

The fact that in 99 per cent of all cases the tumors develop on the surface of the body seems also to indicate that the infection takes place through the skin, and the few cases recorded where the deeper seated muscles have been affected, for instance, the muscles of the diaphragm, or those popularly known as the tenderloin, without the presence of tumors on the surface, may be due to the germs gaining direct entrance into the lymph stream, which carries them directly to muscle groups located in the interior of the body.

Termination and Treatment.—As already stated, it is exceedingly rare that an animal affected with blackleg recovers. In Europe very few of the veterinarians and scientists who have made investigations along this line have ever been fortunate enough to observe a case of recovery.

In this country recoveries from blackleg do not seem to be extremely rare, if one may judge from the observations made and reported by the stock owners. Question 6 on the inquiry blank sent out by the Bureau of Animal Industry reads: "Have you ever seen an animal recover from a recognized case of blackleg? If so, please describe it as fully as possible." In reply thereto 120 stock owners state that they have seen animals recover from blackleg. There is, however, the same objection here as in the old country, namely, that the stockmen may be mistaken in their diagnosis; but as anthrax does not prevail to any extent in most of the districts from which these recoveries have been reported, it is highly probable that a large percentage of the cases referred to were really blackleg, and many of the stock owners describe the cases which came under their observation in such a manner as to leave very little doubt.

In reporting these cases of recovery, a number of the cattlemen described the various therapeutic and surgical efforts to which they attribute the recoveries. An examination of the reports shows that the treatment generally adopted when the cattle are on the range consists in profuse bleeding and violent exercise in connection with deep incisions into the affected parts. In many cases an attempt is made to destroy the virus at the point of infection by pouring turpentine, various acids, concentrated lye, petroleum, vinegar, etc., into the incisions. The bleeding is done by opening the jugular vein, cutting off the tail, or "nerving" between the hoofs, which generally means to make an incision between the hoofs, severing the artery which is located there. The violent exercise consists in tying the affected animal to the saddle horn and dragging it for one or more miles.

The condition in which this treatment leaves the unfortunate sufferer is, however, in most cases, deplorable. When the disease has developed to a point where it is safe to conclude that an experienced stockman cannot well mistake it, that is, when a crackling tumor has appeared and the animal is lame, the only way to recovery is either through resolution of the serosanguinolent exudation, before the affected muscles have been destroyed and the covering skin become gangrenous, or else the affected tissues must slough away and be replaced by cicatricial tissue. In all cases where the recovery is reported to have taken place in the course of a few days or a week, the first way is the only possible one in which it could occur. But here we must accept the owners' diagnoses with reservation, as no authentic cases are recorded in this country. If the animal survives the first five to seven days, it seems that the disease has exhausted itself, and if the depleted system has strength enough left it enters upon a long convalescence, constantly retarded by the local tissue destruction, which must heal through granulation under a constant drain upon the system from suppuration, and which in most cases leaves the animal a cripple and a runt for life. And when it is remembered that the majority of stock owners who have recorded one or more cases of recovery as a result of certain treatment have applied the same treatment and remedies in dozens of other cases without success, it seems to be in every respect wiser and more humane either to leave the affected animal alone or dispatch it as quickly as possible; for there can be no doubt that chasing an animal affected with blackleg over miles of ground, with virulent blood oozing at every step from a number of incisions in the swollen parts, is sure to scatter the infection in a manner which could never occur under natural circumstances, and is bound to bring to grief many a succeeding generation of calves. For this reason it is strongly advocated never to use the knife on an animal suffering from blackleg unless it is kept confined in a place which can afterward be disinfected thoroughly or from which healthy animals are constantly excluded; and it should be borne in mind that the spores of the blackleg bacillus retain their disease producing properties for years after they have left the body of the affected animals, and that, although they do not multiply outside of the animal economy, they are merely awaiting an opportunity to regain an entrance thereto and continue their destructive work.

Preventive Measures.—From the preceding discussion it will be seen that remedial treatment is of little avail, and consequently our principal resource against the disease is prevention. The various measures employed for this purpose may be classified in two groups: (1) Those which aim at destroying or preventing the spread of infection in all places where cattle are kept, and which may be termed hygienic measures; and (2) those which operate to fortify the systems of susceptible animals against an effective invasion of the blackleg germ, and which may be called prophylactic measures.

Hygienic Measures. How Infection is Spread.—When it is known that blackleg occurs with more or less regularity in a pasture, feed lot or stable, it is due to the presence of the blackleg germ, either in the ground of these places or in materials (coarse feed, etc.) brought there regularly. Whenever an animal becomes affected, the germs multiply by the million in its system, and their liberation through natural or artificial means, tends to preserve, increase or spread the infection. In the large pastures of the West and Southwest an affected animal is rarely noticed until after death, when the swarms of buzzards or other birds of prey indicate that there is something dead, and an investigation is made. It is then frequently too late to prevent the spread of the infection, for wolves usually attack the carcass in short order, without even waiting for the animal to die, and only the bones and pieces of the hide are found scattered over an acre or more of ground.

In more densely populated districts, where a sick animal is rarely discovered, there is, as mentioned earlier in this article, often an inclination to doctor an animal, usually by means of a jack knife, and the result is the same as in the other case, the infection is scattered broadcast from incisions made in the affected parts.

In some districts the cattle that die from blackleg are skinned in order at least to save the hide, and the remaining parts of the carcass are left to take care of themselves. This process naturally assists in scattering the infection.

It is therefore of the utmost importance that cattle owners in the infected districts be made to realize that an animal infected with blackleg may be the cause of large subsequent losses from the same disease, maybe not immediately, but within a period of years to follow, and it cannot be too urgently recommended that they make every effort to reduce the danger by taking adequate measures to destroy as completely as possible this source of renewed infection.

Destruction of Infection.—For this purpose the French scientists recommend various methods, some of which, however, are impracticable under the conditions which obtain in the infected districts of this country. They propose, for instance, to place the dead animals in a tank of sulphuric acid until completely dissolved. Where wood is plentiful the best method is to cremate the carcass. In order to insure its complete destruction the dead animal should be placed on a couple of logs and plenty of dry wood heaped around it. A couple of quarts of kerosene oil should then be poured on and fire set to it. It is necessary that the carcass be entirely destroyed; if any part of it remains, another fire should be built over it.

In a pasture where wood is scarce the carcass may be buried. This method is always more or less unsatisfactory, as the infection is not destroyed but merely removed to a few feet below the surface, whence it may return through various means of egress, for instance, as demonstrated by Pasteur, through the agency of earth worms. It is therefore of importance that the hole in the ground be made at least 6 feet deep and the carcass well covered with lime before the earth is filled in. The lime has no special germicidal effect on the blackleg bacillus, but may prevent the infection from being carried to the surface. The place where the animal was lying before being buried, as well as the top of the grave, should be freely sprinkled with a 2 per cent solution of creolin, or any of the carbolic sheep dips or disinfectants which are guaranteed to contain thymol or eucalyptol. The two latter substances are especially recommended by the French scientists because of their destructive action on the blackleg germs. Owing to the difficulty in destroying the infection, it may be well to repeat here that all attempts at treating an animal affected with blackleg through scarifications or incisions into the affected part should be abandoned as dangerous and unprofitable. It is far better to destroy the animal as soon as all doubt as to the diagnosis has been dispelled, and to burn the carcass immediately, without removing it from the place where found. As stated before, the fresh virus is much more easily destroyed than the dried, and by quick action a better result is always assured. If the animal dies from blackleg in a stable it becomes

necessary to remove the carcass to a proper place for its cremation or burial. Care should be taken to scatter straw or hay wherever there is a possibility of infecting the stable floor or the ground with the discharges or exudations from the carcass while it is being removed. All litter should be removed from the stable and burned, together with that used in removing the carcass. The woodwork and floors of the stable should be thoroughly and repeatedly soaked with one of the previously mentioned disinfectants or with corrosive sublimate (1-2,000).

Freeing Pastures of Infection.—The question of how completely to eradicate the disease from a pasture has been much discussed, but no sure means have been found. The usual method of preventing the infection from renewing itself by keeping cattle away from the pasture until it had died out cannot be employed in this case, as outbreaks have been recorded in this country in pastures where no case of blackleg had occurred for eleven years, and few people can afford to keep a pasture unstocked for that length of time. It has been claimed that complete drainage and cultivation of the soil for several years will prevent further outbreaks, but where the question concerns large pastures which are unfit for anything but cattle raising this measure is, of course, out of consideration.

Several ranch owners, especially in Texas, have reported that blackleg never caused losses of any consequence until after it became impossible to burn the pastures off regularly every winter, and this statement, which in some cases is based upon actual observation, is no doubt correct. Whether this condition is due to overstocking or to an actual decrease in the annual rainfall need not be discussed here, but the fact remains that in many of the southwestern cattle raising districts the winter grass, as a rule, is barely sufficient to keep the stock alive until spring, and not a straw remains to be burned off at the end of winter. As stated before, no agent has a more destructive effect on the blackleg germs than heat, and no doubt it might be profitable for owners of badly infected pastures to allow the grass in them to grow rank and burn it off during the winter. It is held by the French scientists that when the infection on the surface becomes attenuated through exposure to varying climatic conditions it may have its virulence reinforced through lactic acid formed during the natural fermentation in the soil. Such an acidity of the soil would, however, immediately be neutralized by burning off the pastures, thereby depositing on the surface a layer of alkalis in the form of ashes, and the attenuation of the germs which escaped destruction through the heat might continue without interruption.

Removal of Cattle to New Pastures.—When blackleg appears in a herd, a common remedy is immediately to move the animals to another pasture. From a number of reports received, this seems in certain regions to be considered the only sure means of stopping the disease, but in most cases the effect is but temporary. If the new pasture to which the animals are taken is free from infection, it is natural that no more cases should occur, if none of the animals were infected previous to leaving the old pasture. Such cases would develop in the course of a few days, and, if no precautions are taken, infect the new pastures to a greater or less extent. But, as a rule, conditions are very much alike in all pastures on the same ranch or farm, and after a while, when the animals have become familiar with their new surroundings and begun to thrive again, the disease reappears. The results, however, seem better when the pasture to which the afflicted cattle are taken is of decidedly poorer quality than the one where the disease first broke out. This, in connection with the fact that the change which generally gives the cattle more or less exercise in rounding up and driving, produces a temporary lull in the outbreak, seems to indicate that the animals under certain conditions are less susceptible to the disease, and that the temporary increase in power of resistance must be due to certain chemical or metabolic processes in the animal economy which are dependent upon the relative proportion between the amount of exercise and the amount of nutrition of which the animal partakes. All cattle owners in the infected districts agree that a reduction in flesh, no matter in what condition the animals may be, tends to allay or stop an outbreak of blackleg. But, as it is contrary to the interests of stock raisers to interfere in any way with the growth and development of young cattle, it is obvious that preventive measures along this line should be avoided or resorted to only as a temporary relief, while less injurious and more certain remedies are provided in the meantime.

Prophylactic Measures. Setoning, or Roweling.—Setoning, or roweling, which consists in producing a large running sore in the dewlap or on the shoulder, and which, through profuse suppuration, drains the vitality of the animal, should only be resorted to as a temporary measure. When practiced

regularly it simply prevents growth and stunts young animals, besides affording an opportunity for the introduction of other disease germs. In England, where public opinion is against vaccination, this method has been employed extensively, and much has been written for and against it. The two principal authors on this question, Stewart Stockman and J. McFadyean, are both of the opinion that roweling is of no value as a preventive measure, the former even holding that it has the opposite effect. In support of this statement, he quotes the following case:

"At the request of a client whose losses from black quarter are annually very high, a friend of mine setoned fifteen yearlings. For some reason a sixteenth animal was not setoned. The sixteen animals were all pastured on the same meadows. All the setoned animals died of black quarter and were survived by the one that had not been setoned." Such evidence speaks for itself. The fatal result in this case is no doubt due to a too prolonged action of the seton. The same author has proved experimentally that animals which have been setoned for one month succumb more readily to an inoculation of blackleg virus than animals which have not been setoned at all, and a number of stockmen in this country who have been in the habit of roweling their cattle declare that the protective effect of the seton soon wears off, although it seems effective for awhile. In the writer's opinion, the seton, if used at all, should not be left in the sore for more than a week or ten days, or sufficiently long to allow the owner to obtain blackleg vaccine and use it on his cattle.

To Arloing, Corvenin, and Thomas belong the honor of first discovering that animals may be protected against blackleg by inoculation with more or less virulent material obtained from animals which have died from blackleg. They found that the hypodermic injection of minimal doses of fluid from a blackleg tumor did not necessarily result in death, but frequently produced a mild attack of the disease, unaccompanied by any swelling, and that animals treated in that way were afterward possessed of a very high degree of resistance to the disease. There are, however, few diseases where the individual susceptibility varies to a greater extent than is the case in blackleg, and, as it was impossible to ascertain beforehand the degree of susceptibility or power of resistance possessed by each animal, the exact dose to employ in each case could not be determined, and the method was abandoned as being too dangerous. Even when the inoculation was made at the extremity of the tail, it frequently resulted in the development of a swelling which spread to the rump and killed the animal, or else the tail became gangrenous and dropped off.

When the virus, either fresh from a tumor or dried, is introduced into the blood stream or into the trachea, the animal shows great resistance to its effect and subsequently becomes immunized. It is, however, rather difficult to inject the virus either into the jugular vein or into the trachea without infecting the surrounding connective tissue, and the technique of the operation is too complicated to be of practical value when large numbers of cattle are to be vaccinated. Nevertheless the French scientists practiced it on 500 animals with only one death resulting from the operation.

Attenuated Virus.—Prolonged exposure to a high temperature serves to attenuate the virulence of either fresh or dried virus. This fact was employed by the above mentioned authors for the preparation of a vaccine which may be used in every day practice with little danger of injuring the cattle. The material used for the vaccine is obtained from a fresh blackleg tumor, by pounding the muscle tissue in a mortar with the addition of a little water and squeezing the pulp through a piece of linen cloth. The juice is spread in layers on plates and dried quickly at a temperature of about 35 degrees Centigrade. This temperature does not in the least affect the germs, and the dried virus obtained in this way retains a high degree of virulence for a couple of years or more.

When vaccine is to be prepared the dry material is pulverized and mixed in a mortar with two parts of water until it forms a semifluid homogeneous mass. This is spread in a thin layer on a saucer or glass dish, and placed in an oven, the temperature of which can be regulated with exactness. The reason for mixing the virus with water is to insure a quicker and more uniform attenuation. The temperature of the oven is usually brought up to 100 degrees to 104 degrees Centigrade, and the virus is allowed to remain in it for seven hours. When removed, it appears as a brownish scale, which is easily detached from the dish. The scale is pulverized and mixed with water, and when inoculated under the skin of calves in doses of 1 centigram per head it produces partial immunity. Subsequent inoculation with

virus which has been heated for the same length of time, but at a temperature of 90 degrees to 94 degrees Centigrade, serves to reinforce the immunity. The inoculation is followed by insignificant symptoms. In a few cases there is a slight rise in temperature, and by close observation a minute swelling may sometimes be noted at the point of inoculation. Eight to ten days are allowed to pass between the first and the second inoculation. For reasons already explained, the vaccine is injected at a place where the subcutaneous connective tissue is dense and unelastic, generally at the extremity of the tail or the external surface of the ear, as far from the base of either organ as possible. The immunity conferred in this way lasts for at least eighteen months, but animals which are vaccinated before they are one year old should be revaccinated the following year. The Davis Blackleg Outfit should be used in administering the virus.

Malignant Catarrh,

or Infectious Catarrhal Fever, may be defined as an acute, infectious disease of cattle in which the respiratory and digestive organs are involved in the affection. It is believed to be due to micro-organisms, perhaps belonging to the bacteria, but the cause is not yet determined. Strictly speaking, it can hardly be called a contagious disease, and appears chiefly in isolated or consecutive cases. The predisposing causes are but little known, some claiming it to be due to lack of sanitation and hygiene in stables and barns. The disease may recur year after year on the same farm or in the same locality. It is not known whether the conditions of the soil have any bearing on the disease. It is not a disease which spreads to a great extent, or which causes severe losses.

Symptoms.—Young and well nourished animals are especially liable to be attacked. The incubatory period is said to be three to four weeks, varying from case to case. It usually begins with a chill, followed by a high fever, 104 to 107 degrees Fahrenheit. The head droops, the skin is hot and dry, the coat staring. Other symptoms are quivering of the muscles, marked dullness, passing by degrees into an almost stupefied condition. Secretion of milk stops in the beginning of the disease. Affections of the eye are characteristic of the malady. There is an abundant formation of tears, which run down over the face; lids are swollen and inflamed, the animal shuns the light by keeping them closed. The simple inflammation may be followed by an inflammation of the cornea, which may lead to permanent clouding. Inflammation of the iris is occasionally seen. Inflammation from the membranes of the mouth, nose, and the sinuses of the head leads to discharges from the mouth and nose. Membrane of the nose is reddened, and may be covered later with inflammatory deposits. Bowels are at first constipated; later diarrhea sets in and the discharges become soft, offensive and streaked with blood. Great uneasiness, amounting in some cases to madness and furious delirium, in others to spasms and convulsions or paralysis, are features of the general symptoms. Like other infectious diseases, malignant catarrh pursues a longer or shorter course in accordance with the severity of the attack. In acute cases death is said to take place from three to seven days after the appearance of the symptoms. When recovery ensues it may take three or four weeks. From 50 to 90 per cent of the affected animals die.

Treatment.—No specific treatment exists for this affection. Preventive treatment, which insists on the removal of the infected animals and a thorough cleaning and disinfection of the infected stables, may prevent the subsequent appearance of the disease. If the floors are low and damp, they should be raised and made dry. Keep the digestion and general health of your herd up to the standard always, constantly allowing 2 tablespoonfuls of Davis Stock Food to each feed of the daily ration, and improved vitality and strength, with attendant immunity from disease, will be the reward.

Southern Cattle Fever,

or Texas Fever, so called, is a specific fever, communicated by cattle which have recently been moved northward from the infected district, or which is contracted by cattle taken into the infected districts from other parts of the world. It is characterized by the peculiarity among animal diseases that the animals which disseminate the infection are apparently in good health, while those which sicken and die from it do not as a rule infect others.

Causes.—Texas fever is caused by an organism which lives within the red blood corpuscles and breaks them up. It is therefore simply a blood disease. It belongs to the protozoa family, as distinguished from bacteria; in other words, it is not a microscopic plant, but belongs to the lowest form of the animal kingdom. It multiplies rapidly in the body of the infected animal, and in acute cases causes an enormous destruction of red corpuscles in a few days. It is not possible to state how it gets into the

red corpuscles, but all the various processes which go on in Texas fever and which we may observe by examining the organs after death, result from the destruction of these minute bodies. The destruction may be rapid or slow; when rapid we have an acute, usually fatal type of Texas fever which is always witnessed in the height of the Texas fever season, that is, during the latter weeks of August and the early September days. When the destruction of corpuscles is slower, a mild, usually non-fatal type of the disease is called forth, which is only witnessed late in autumn or more rarely in July and the early part of August. Cases of the mild type usually become acute later on and terminate fatally.

Various names are given to the disease in different localities. It is called Spanish fever, acclimation fever, red water, black water, murrain, dry murrain, yellow murrain, and bloody murrain. In regard to the means by which the disease is communicated, experience shows that this does not occur by animals coming near or in contact with each other. It is an indirect infection. The cattle from the infected districts first infect the pastures, roads, pens, cars, etc., and the susceptible cattle obtain the virus second hand from these. Usually animals do not contract the disease when separated from infected pastures by a fence. If, however, there is any drainage or washing by rains across the line of fence, this rule does not hold good.

The cattle tick, *Ixodes bovis*, is mainly responsible for the carrying of Texas fever from the South to the North. It is essentially a parasite attaching itself to the skin and drawing the blood of its host. It is unable to come to maturity and reproduce its kind unless it becomes attached to the skin of cattle, whence it may obtain its food. Its life is spent largely on cattle. Southern cattle sent north during the spring and summer months carry on their bodies large numbers of the cattle tick. These when matured drop off and lay their eggs on northern pastures. These hatch and the young tick soon gets upon any northern cattle which happen to be on the pastures. As soon as they have attached themselves to the skin they inoculate the cattle and Texas fever breaks out a week or more thereafter. The larva after emerging from the egg is very minute, six-legged, and just visible to the naked eye. On pastures these little creatures soon find their way upon the cattle. They attach themselves by preference to the tender skin on the escutcheon, the inside of the thighs, and on the base of the udder. The fever in cattle attacked appears before the ticks have matured.

Symptoms of Texas Fever.—After exposure to infected soil, the disease first shows itself in dullness, loss of appetite and a tendency to leave the herd and lie down. A few days before the symptoms appear the presence of high fever may be detected. The temperature arises from a normal of 101 to 103 degrees Fahrenheit to 106 or 107 degrees Fahrenheit. There seems to be little or no change in temperature until recovery or death ensues. Bowels are mostly constipated during the fever; toward the end, feces may become softer and rather deeply tinged with bile. Urine is normal until near the fatal termination, when it at times is deeply stained with the coloring matter of the blood. The pulse and respiration are usually much more rapid than during health. As the end approaches emaciation becomes very marked, the blood is thin and watery, and the closing of any wound of the skin by clots is retarded. There is increasing stupor, tendency to lie down most of the time, sometimes signs of delirium. Death occurs as a rule in the night. In the mild type of the disease, which occurs in October and November, symptoms of disease are well nigh absent.

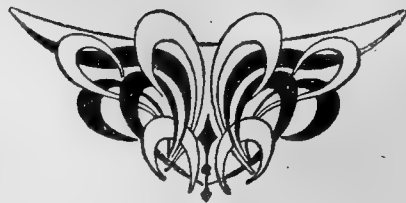
Treatment.—As soon as the disease has made its appearance, all animals, sick and healthy, should at once be removed to a non-infected pasture. This, although not putting an end to the disease, may save the lives of some members of the herd by removing them from the possibility of being attacked by any more ticks. Removal from infected pastures likewise prevents a second attack in October or early in November, which is caused by another generation of ticks. It is true that sick natives infect with a new generation of ticks the pasture to which they are removed, but these usually appear so late that they have but little opportunity to do damage. No systematic experiments have as yet been made in the medicinal treatment of the sick. Sulphate of quinia, in doses of 15 to 30 grains, according to the size of the animal, has given good results in the hands of some practitioners, and tincture of aconite root and Epsom salts have been combined with it according to indications of the individual disease.

There is at present no known method of ridding pastures of ticks without destroying the vegetation. Every pasture once infected is dangerous throughout the season. Fortunately winter destroys

the tick and a fresh importation from the South is necessary to reproduce the disease. In sheltered places near the Texas fever line, they may, however, live through very mild winters and produce disease the following summer. The previous remarks have reference only to northern pastures.

Regarding sanitary regulations, the disease, outside of the infected district, may be prevented by proper steps being taken to that end. Regulations covering this subject are now yearly made by the Secretary of Agriculture. They define the boundary of the infected district, and provide that no cattle shall go out of it except for immediate slaughter between the dates of February 15th and December 1st. Cattle from the district going to slaughter cannot be driven, but must be shipped by rail or boat. Way-bills and cars are marked "Southern Cattle" when they cross the boundary line, and when unloaded for feeding, watering or sale they are placed in pens set apart for such animals and into which native stock is not allowed to go. The cars and boats which have transported such cattle must be disinfected and cleansed thoroughly before native stock can be carried.

Thus does Uncle Sam aid his people in preventing the spread of this probably most dangerous of all diseases to which American cattle are subject. And we ought, all of us, each in his own way, give the government a helping hand in the effort to stay the spread of disease in every form in the herds of cattle of this broad land, conducive alike to the prosperity of their respective owners and to the American nation. It is our hope that this book, largely compiled as it is from the wealth of statistics and scientifically demonstrated results of experiments with which the government has provided us, will contribute in no small degree to this end. One thing we would like to impress upon the reader in conclusion of this chapter, as we have done in all the previous chapters, namely, that Davis Stock Food and other preparations have been selected and compounded with this view alone in mind. They are scientific combinations of twentieth century remedies and methods, for the prevention and cure of all the diseases to which our domestic animals are subject, and for improving their various breeds through careful feeding to the highest possible degree of efficiency and value. In this spirit we recommend our preparations to the cattle breeders of the United States.



DISEASES OF SHEEP.

THE BRAIN AND NERVOUS SYSTEM.

It is true that the human being is endowed with the finest and most sensitive nervous system in all the animal kingdom, but this does not by any means imply that animals, and more especially our domesticated animals, are incapable of feelings and emotions akin to those experienced by the human. The fact is that the nervous system in all species throughout the animal world is built in accordance with the same universal law, and that the differentiations from the lowest to the highest forms is merely a matter of degree and intensity as regards the phenomenon which we call feeling or sensation. Thus we know that the finer bred the animal is, the more high strung and sensitive does the nervous system become.

The sheep ranks among the most highly organized, finely nerved specimens of our domesticated animals, and for this reason it is well that we, as an introduction to the following pages, the contents of which concerns the sheep and its diseases, should devote a few paragraphs to a description of the nervous system, its functions and vagaries in health and disease.

You may be interested in knowing that each of the divisions of this wonderfully constructed, intricate system of nerves, whose subtle ramifications extend to every part of the body, have phenomena peculiar to themselves, enabling the studious man who has paid enough attention to this branch of animal anatomy, to ascertain which are involved in any one specific disease. We divide the different classes of disease in accordance with the parts involved, calling diseases of the brain, cerebral; of the spinal cord, the spinal, and of the nerves, the peripheral. If the brain is diseased a loss of perception, volition and special sensation is the result. Should one side or part of the body become paralyzed, either motor or sensory, the brain is affected and suffers, but in case of transverse paralysis, which affects the hind limbs or a posterior portion of the body, this indicates disease of the spinal cord. The same holds true of incontinence of urine or retention, which again indicates that the cord is affected. If only a local part, as for instance a portion of the leg, a muscle or set of muscles are paralyzed, it indicates a diseased condition of the nerves which supply that part, and is called peripheral. If you should fracture or otherwise injure the outer portion of any part of the brain, it will immediately affect the voluntary motions of the animal sustaining the injury, but if the inner, deeper lying portions of the brain are injured it will affect the involuntary or automatic motion, the actions of the heart, the respiration, digestion, etc., classified under the name of the vital functions. Any severe injury to the vital parts of the brain, from which ramify the nerves that sustain these functions, will cause instant death by their suspension. In the same way do all injuries covering the entire system cause a higher or lesser degree of excitation, increased nervous excitability or paralysis. An unexplainable peculiarity of this, the electric battery of the body, is that great derangement in its regular, normal functions may take place without it being possible to discover any structural alteration or impairment in its substance.

Cerebritis,

also known as Frenzy, and in scientific language called Encephalitis, may be defined as inflammation of the brain substance, and is often met with after the operation for gid; or it may follow an injury to the cranium of the animal or an attack of apoplexy. Exposure and exhaustion, which cause the blood to become impoverished and poisoned, may also develop it. Other causes are feed of too stimulating properties or an excess of coarse, innutritious feedstuffs. Overripe rye grass tops may be to blame, and among other predisposing influences a plethoric condition of the body and exposure to the burning rays of the sun during the hot season. Grown sheep are rarely affected with this disease, except by direct injury, while lambs are more frequently attacked by incorrect feed and consequent disturbances of the bodily functions, reacting upon the growing and delicate nervous structure.

Symptoms.—Early in the case a stupor takes possession of the victim. Dullness and indisposition, the animal being unwilling to move, gives way to a state of delirium in which the animal becomes more or less frantic, restless and excitable, throwing itself about violently. The eyes are staring and look as though they would bulge from their sockets; linings of the eyelids appear swollen and red; pupils of the eyes contract; bowels are constipated and respirations irregular. These violent symptoms are most evident in lambs, who of a sudden, after being affected with the disease, commence to dance and skip about like little windmills, in a way that to the observer, who does not divine the cause, seems shriekingly funny. It is recorded that our worthy ancestors, the men and women who in the light of our greater experience and intelligence must forever appear as big, foolish, ignorant and superstitious children, were in the habit of burning the little devils at the stake as they did their regular old woman witches, under the belief that they were possessed by the evil one. In being struck with the disease grown sheep may of a sudden jump high in the air and fall down dead. If the attack is prolonged there are periods of nervous excitation interposed with exhaustion. While the acute period lasts sheep runs about with the tail carried upward, breathing hard. In its madness it butts at men and other sheep or animals, running up against anything it encounters.

Treatment must be prompt if it is to be effective. Bleeding from the jugular vein is advised, taking about 8 ounces of blood from a grown animal. Follow with a cathartic. Then give Epsom salts, 4 ounces in $\frac{1}{2}$ pint of water, to which add 1 dram of Jamaica ginger. If a valuable sheep confine the patient in a place where it cannot do injury to itself under the spasms; 1 dram doses of bromide of potassium being given every two or three hours to quiet the nervousness. Follow this with Davis Stock Food as directed for sheep and the recovery will be complete.

Louping Ill,

popularly called Tremblings, Thorter Ill, Mad Staggers, is a disorder apparently caused by a derangement of the nerves of the hind parts, due to an inflammation of the spinal cord in the region of the loins. This inflammation is followed by a serious effusion, which in less severe cases coagulates, changing into a sort of fibrous tissue. Permanent pressure on the cord is produced, not enough to produce complete paralysis, but sufficient to cause derangement of sensibility. This is a remarkable disease, peculiar to the sheep family, and large losses have been caused by it. Governmental and other investigations as to its nature and origin have, however, so far shed little light on the subject. Its history shows that it has existed in epidemic form from time to time in different parts of the world, notably in Scotland. Some authorities have laid its cause to liming the soil, arguing that their experiments demonstrated that it disappeared when the lime was exhausted; others contend that the disease is due to inflammation of the brain and spinal cord; others again that smut on grasses is responsible. Coarse, withered grass feed, ticks, overstocking, poverty, dry easterly winds in April and May, etc., have also been claimed as the cause, and between it all we remain to a large extent in obscurity, without any direct scientific basis whereupon to base any of these popular observations.

Symptoms.—Head and neck are attacked with periodical spasms, contracting or drawing them backward with a violent jerk, which tends to constrict the esophagus, threatening strangulation if the swallowing of liquids is attempted. A frothy saliva is emitted from the mouth, especially during the convulsive fits, which may occur every five minutes, accompanied with a very laborious and quick respiration, subsiding on termination of the attack. Other symptoms are trembling of the hind parts; twitching of the muscles; accelerated pulse; dry and hard skin; catarrh, emaciation; sheep grinds its

teeth, pines slowly away, and at length death ensues. It has been claimed by some authorities that it is only since the introduction of Merinos and other high bred, fine woolled sheep that the disease has developed. In the early stages of the disease the sheep are in poor condition and gradually falling off, the fleece is dry and dead to the touch, the nervous symptoms soon following, generally evidenced by a loss of power in one or more of the limbs, the whole side at times being involved. A sheep may exist for days in this condition, and should it not recuperate and rally, death will sooner or later ensue. Even in recovery the use of a hind leg will to many of those patients be lost for a long time, it being drawn behind them in moving and dead and cold to the touch. Tumors filled with pus may appear around the joint or on the fore leg or brisket.

Treatment.—There is no cure for the disease proper and the treatment must be altogether preventive. Remove the flock to new and fresher pastures; feed oil cake and other good commercial feeds; give lambs a sufficient dose of Epsom salts to act as a purge, the adult sheep about 4 ounces. A stimulating, nutritious diet, with Davis Stock Food always added to the ration in the proportion of 1 teaspoonful to each feed for the grown sheep and $\frac{1}{2}$ teaspoonful to each feed for a lamb, is the best safeguard for this destructive disease. It should be remembered that Davis Stock Food, acting as it does at the same time as a tonic and digestive, stimulating the salivary glands of the mouth, liberating the juices of the stomach, and by thus directly influencing the digestion, causing all feed taken into the body to be assimilated, produces such a healthy, unobstructed circulation that the risk of your flock of sheep being attacked with disease is lessened 75 per cent; that is, if you are careful to always have it on hand and feed it regularly. Good hygienic surroundings are also here as elsewhere of the greatest importance, and the folds and houses in which the sheep are kept should at all times be clean and sweet in every particular.

Simple Paralysis, in the popular language of the people known as Palsy, may be described as a loss of power, sensory or motor, or both. Lambs are most frequently attacked by this disease, the cause being the exposure of the ewe at weaning time, rough weather, and lack of sufficient or proper nutriment. Ewes also at times are affected with the disease, as the result of abortion, prolonged and difficult labor, etc. When the new born lambs are affected they often die in one night. Other causes are chronic or habitual constipation, indigestion caused by partaking freely of roots, or poisons entering the system with grasses.

Symptoms.—In milder cases the lamb is discovered standing still, apparently unable to move, and upon examination it is found that its hind parts are powerless. The patient rarely recovers if the motor functions are generally affected, and the period before death is usually marked by a persistent and violent diarrhea.

Treatment.—Tonics and digestives, such as Davis Stock Food, combined with purgatives and stimulating liniments, are the remedies recommended for combating the disease. Give adult sheep the usual dose of 1 teaspoonful of Davis Stock Food to each feed. If the loins are badly affected on a valuable lamb or sheep which the owner desires to go to some trouble in saving, clip off the fleece for a space of 3 inches each way and paint the back with a solution of lunar caustic, 1 dram to 1 ounce of distilled water. Apply some of this with a brush to the affected parts, continuing with its use daily for two or three days. Then stop, but repeat treatment again in the course of eight days, if considered necessary. It is perhaps the best plan in all cases where the sheep or lambs are in good condition, and able to command a price on the market that will compensate the owner for their loss, to sell them to the butcher, if they do not happen to be of such value that the owner is willing to go to some trouble in order to save them. In the case of newly born lambs, rub the little animal well all over the body, gradually warming it; then give 1 teaspoonful of sweet spirits of niter in a little warm water, returning the lamb to the ewe. Carefully house both the mother and her offspring with clean bedding; feed the mother on wholesome, nourishing feed, protect them from drafts and cold winds, and make it as comfortable for them as though they were of the human family.

THE RESPIRATORY ORGANS.

Nasal Catarrh, or Snuffles, often affects sheep which have been exposed to inclemency of the weather. It is an inflammation of the lining membrane of the nose, and may be either acute, subacute or chronic. It is very much like an attack of cold in the human. Sheep which have been shipped a long way often are severely affected with snuffles when arriving at their destination. The early winter season is the time where the largest number of such cases occur in a herd.

Symptoms.—Acute: Feverishness, rapid breathing; high color of the visible mucous membranes of the nose and mouth, due to accumulation of mucus from the inflamed surfaces. At the beginning the patient sneezes, shakes its head, evinces pain, and in a little while a mucous discharge from the nostrils sets in. In the course of a couple of days pus forms and is emitted with the discharge; discharge becoming thick, but without smell. Without treatment disease often lasts for several weeks in this state, nature in the end either effecting a cure or the inflammation of the lung tissue gaining the upper hand, resulting in pneumonia or bronchitis, which is often of fatal consequence.

Treatment.—Cause affected sheep to be removed from places of exposure; feed them on a light nourishing ration, and tone and stimulate their digestive organs by adding Davis Stock Food to each feed in the usual proportion (1 teaspoonful to each feed for the grown sheep and $\frac{1}{2}$ teaspoonful to each feed for the lamb). This with proper care in the way of protection from cold air and drafts will generally produce a cure. The disease, popular belief notwithstanding, is not contagious, and if a large number of cases occur at the same time in your flock you may safely attribute it to the same cause—errors in hygiene or feeding. Catarrh produces a weakening and exhaustion of the affected sheep, hard to overcome, and which makes them unprofitable feeders. You should therefore carefully guard against it, by always protecting your flock in all possible ways against inclement weather, especially the storms of fall and winter. Next in importance is to so harden and strengthen the sheep that it is able to withstand such exposure as is unavoidable; and here we would again call your attention to Davis Stock Food, which, by perfecting the digestion and assimilation, and through them the blood circulation, speedily builds up the entire system of the animal, making it to a large extent immune from disease. Feed it regularly 1 teaspoonful to each feed, and it will save you much loss and worry as time passes on.

Sore Throat, or Laryngitis, is an inflammation of the membrane of the larynx. In acute cases the swelling is spongy, the blood vessels of the throat are engorged with blood, and gangrenous patches form at times on the mucous membrane, often extending over the entire throat, producing diphtheritic sore throat, a common affliction.

Symptoms.—Fever; rapid respiration; the head is projected in a straight line, the mouth held open; there is a frequent, painful cough; swallowing is difficult, this especially holding good of liquids, which are apt to return through the nose; eyes protrude more or less; saliva forms in the mouth, dribbling from the animal in its efforts to swallow. The whole system is more or less upset.

Treatment.—Twice or thrice daily apply Davis Veterinary Liniment to the throat and rub it in thoroughly with the hand. If the herdsman doesn't happen to have this, try the following: Oil of turpentine, 1 ounce; strong aqua ammonia, 1 ounce; linseed oil, 6 ounces; mixed and shaken well together before applied. As an internal treatment give Davis Stock Food in double doses, or in its absence give the following: Tincture of iron, 6 drams; chlorate of potash, 4 drams; water, 8 ounces. Give three times daily, 1 tablespoonful each time. Lambs should only be given one-quarter of the dose. With care and treatment this disease usually yields in the sheep. Feed it on a light nourishing ration while affected, adding Davis Stock Food in the usual quantity. Carefully protect it against cold winds and draft; keep its quarters clean and comfortable. Commence treatment as soon as the first symptoms show themselves. Davis Stock Food may with advantage be given both in health and disease.

Bronchitis is a catarrhal disease, affecting the mucous lining of the bronchial tubes, often found as a complication with laryngitis and catarrh of the nose. Exposure to wind and weather, the breathing of vitiated air, etc., are fertile causes for its appearance in both grown sheep and lambs.

Symptoms are similar to those of catarrh of the nose, with a few exceptions; moist cough; a wheezing sound from the air pipes; fever; throat and belly are tender to the touch; respirations quick, increasing in rapidity as disease progresses; loss of appetite; thirst, which is most pronounced toward the last stage of the disease. Peculiar murmurs, called rales, may be heard by placing the ear to the chest, caused by a liquid mucus being present in the bronchial tubes, through which the air must pass during the act of respiration. In the progression of the affection the patient is weakened, urine becomes highly colored and scanty, droppings are coated with slime, dry and hard on the inside, fever continues to manifest itself at intervals.

Treatment.—Put sheep in a large shed where the air is fresh and pure, but protect it from drafts. Tone and stimulate the patient by adding Davis Stock Food to the ration. In severe cases in addition to this give fluid extract of belladonna leaves, 1 dram; fluid extract of licorice root, 2 ounces; muriate of ammonia, $\frac{1}{2}$ ounce; alcohol, 2 ounces; water, 4 ounces. Mix this thoroughly and give the patient 1 tablespoonful twice daily for an adult sheep, lambs in proportion to their age. With this treatment administer 2 drams of sweet spirits of niter twice a day in $\frac{1}{2}$ pint of oatmeal gruel. Do not use purgatives for this affection.

Inflammation of the Lungs, or Pneumonia, is caused by sudden changes in temperature, especially occurring where the climate is damp and wet. Inhalation of vitiating gases also induce an attack, or it may be secondary to milder diseases of the air passages, such as catarrh or laryngitis.

Symptoms.—A persistent, more or less violent cough, is one of the first indications of an attack of pneumonia; then there may be a shivering fit, labored breathing, increased motion of the ribs; flanks heave rapidly; pulse grows quick and strong (at the beginning; toward the end of the disease it weakens); there is loss of appetite; sheep ceases to chew the cud; thirst is considerable; there is discharge from the nose, animal grinds its teeth as though in pain. Weakness and exhaustion increases; the eye has a glazed, staring appearance; there are fits or spasms, and delirium, and finally death ensues.

Treatment.—First of all regulate the animal's digestive and circulatory functions, making the ration light and giving Davis Stock Food in the usual proportion to each feed. Then counter irritation, such as the application of Davis Veterinary Liniment to the sides and chest. Try the following in the way of internal treatment: Sulphate of quinine, 40 grains; whisky, $7\frac{1}{2}$ ounces; tincture of iron, $\frac{1}{2}$ ounce. Mix well, and give 2 tablespoonfuls every four hours in $\frac{1}{2}$ pint of oatmeal gruel. This is the dose for a mature sheep, and lambs should be treated proportionately. If the animal suffers from chronic pneumonia, it is rarely worth while attempting to treat it, as it is practically useless for breeding purposes, and unfit for fattening.

Pleurisy, a disease frequently met with after dipping in the late fall or sheep washing in the spring, is an inflammation of the serous coverings of the lungs and chest cavity. Sudden changes in the temperature, chills and inclement weather are the usual causes. It also may be a complication attendant on other diseases of the parts involved.

Symptoms are similar to those manifesting in inflammation of the lungs. Spasmodic pains also may be observed, causing the sheep to grunt, grind its teeth and appear uneasy and anxious. At the beginning of the trouble the pulse is hard and strong, ears and legs become cold, flanks heave, the ribs appear fixed. If recovery from this condition should not occur in two or three days, indicated by cessation of the inflammation and return of the affected parts to a healthy condition, it is apt to terminate fatally, although death may be delayed for a week or two. Before this second and fatal stage commences there is usually a more or less complete loss of appetite, but as the effusion from the inflamed pleural surfaces takes place, as a result of the inflammation, the sheep may commence to feed, the extremities get warm and an apparent change for the better becomes evident. But this is only a forerunner for the third stage, preceding the fatal termination. As this approaches the effusion increases until the

chest cavity becomes filled with a watery, serous liquid, the respirations once more become labored, the eyes glassy, the sheep soon dying, more from suffocation than anything else. In cases that recover the lungs are frequently found to adhere to the chest walls, due to the adhesive action of inflammation. When sheep are in this condition they become practically valueless, being unsatisfactory feeders, as a rule losing flesh instead of fattening, and unfit for breeding purposes.

Treatment.—Good hygienic treatment, a light ration, to which add Davis Stock Food in the regular proportion. Bleeding, when the disease is discovered in the first stages, is beneficial. The extraction of blood should be not less than 8 ounces from an adult sheep. Do not bleed more than once. When shivering and chills are observed at the commencement of the affection a dose of good whisky, 1 ounce in four ounces of gruel, may be administered with good effect. In the second or more painful and complicated stage of the affection, try the following internal treatment: Fluid extract of belladonna, 2 drams; sweet spirits of niter, 2 ounces; muriate of ammonia, $\frac{1}{2}$ ounce; water, 6 ounces. Mix this preparation well and administer it in doses of 1 tablespoonful every two hours in $\frac{1}{3}$ pint of gruel. Davis Veterinary Liniment may be used in this case also, as an adjunct to the other treatment. The elbows and lower part of the chest should be thoroughly rubbed in with this once a day until recovery.

THE DIGESTIVE SYSTEM.

Sore Mouth,

as a rule, occurs among lambs in the first part of the spring, especially in such as are still sucking the ewes. Adult sheep, however, are by no means exempt, although when the animal gets to be two years old the danger of its being attacked is remote. In the lamb and younger animal it is a very troublesome and occasionally fatal affection. It seems that feeding of turnips sometimes produces this condition, while a faulty diet, improper sanitation and hygiene, the spores of certain fungi, physical exhaustion, and in older sheep carious teeth and low vitality are mentioned among the prominent causes which are liable to produce the disease. One veterinarian who has made a careful study of Sore Mouth asserts that it is caused by a minute organism, contained not only in the milk but also in the watery fluids of the stomach and abdominal organs on a post mortem examination. It seems that the lambs are first affected and the ewes are thus inoculated by their offspring, while the original cause through which the young animal contracts the disease is obscure and uncertain.

Symptoms.—There seems to be a progressive physical exhaustion coming on the lamb. It drags behind, seems unable to keep up with its mother; mouth when lamb tries to grasp or suck the teat is filled with saliva and foam, which coats the udder of the ewe; there is apparently an inability or reluctance in grasping and sucking the teat, probably caused by physical weakness; lamb exhibits a desire to lay down, opposite to its usual tendency to frisk and roam about; the weakness becomes more pronounced, ears hang down, head droops forward; small pimples burst out about the mouth. Subsequently these enlarge, ulcerate, become confluent and form sores which cover with scab; these pimples break out inside the mouth, too, affecting the tongue, lips and gums; in aggravated cases the gums ulcerate, teeth loosen and sometimes fall out, the lower jaw bone becoming inflamed. Should the udder of the ewe be attacked the eruption is similar to that occurring in the mouth of the lamb; teats are full of sores, which dry and become crusted over with heavy black scabs, and when the lamb is unable to extract the milk, both on account of the condition of the udder and that of its own mouth, the gland soon becomes inflamed by retaining the milk, frequently terminating in a gangrenous condition, during which the whole or a large portion of the udder sloughs off. In the worst cases there seems to be a gradual poisoning of the blood, occasioning inflammation of the lungs, abscesses on the lymphatic glands, which in their turn cause prostration, rapid breathing, coughing and inability to move. Death frequently occurs, due to the affected animal being unable to get feed into its stomach.

Treatment.—First separate the flock; take the healthy animals to an entirely new locality, leaving the sick ones where they are until cured. Put the ewes on a light but still nourishing and substantial

ration, it being of the greatest importance to keep their digestive and assimilative functions in healthy active condition by always adding Davis Stock Food to the ration. This in itself will do much to ward off the disease both in the mother and young one. As long as the udder is not affected the lamb should be permitted to remain with the ewe, and the purer and healthier condition of the milk resulting from the change in diet will naturally react for the better upon the suckler. If the udder is attacked the lamb must be fed and raised by hand. The following ointment should be used for the affected udder: Tannic acid, 1 dram; acetic acid, 1 ounce; water, 1 pint. In administering this the gland should be handled with the greatest care. Do not milk it out more than twice daily, and be very careful that you do not bruise it. Considerable trouble is attendant upon this treatment, but if it is desired to save the ewe it must be applied. A dose of Epsom salts as internal medication is beneficial in the beginning, before the disease has gained foothold. Four ounces in $\frac{1}{2}$ pint of warm gruel is about the quantity required for the adult, the lamb in proportion thereto. Mix in the trough with the feed and administer the following preparation: Powdered licorice root, 4 ounces; wood charcoal, 2 ounces; linseed, ground, 5 ounces; sulphate of iron, 5 drams. Mix this well, and give it with the feed twice daily. A small quantity of common table salt may be added to the preparation. The use of the above preparation is unnecessary, however, if Davis Stock Food is used. Wash out the mouth of the lamb several times daily with a solution of chlorate of potash, apply over the sores externally and internally. Or you may make up the wash of the following constituents: Borax, $\frac{1}{2}$ ounce; aqua, 1 pint; swab out the mouth with one of these mixtures (the chlorate of potash mixture should be about $\frac{1}{2}$ ounce to 1 pint of water) and in administering it be careful that very little of it is swallowed by the patient; at the same time you may apply the ointment externally to all affected parts. If the inflammation of the mouth has become gangrenous, try the following: Potassium permanganate, 10 grains; water, 1 pint. Mixed and applied as directed with the other. Should the teeth become loose or carious, remove them, and if the flesh of the mouth or gums shows tendency to inflame and decay in spots, touch the affected places with caustic potash, or, better, nitrate of silver.

Obstruction of the Gullet,

popularly known as Choking, is a disease peculiar to the larynx, esophagus or gullet. Mislodgment of feed is the ordinary cause. It is more often met with in the ox than the sheep, but is occasionally encountered in the latter animal when roots are part of the ration.

Symptoms.—Loss of appetite; the feeding ceases; breathing is heavy and difficult; animal commences to bloat; swelling appears larger in the region of the left flank than in the right. Derangement of the pneumogastric and sympathetic nerves from the irritation helps along the cessation of the vital functions; suffocation from pressure of the distended stomachs on the diaphragm or midriff diminishes the capacity of the chest cavity, preventing free expansion of the lungs, and death often follows these symptoms.

Treatment.—There is no treatment other than the operative, and for quick relief of the suffocating and dying animal a probang is required. This consists of a thin, flexible tube, containing a small knob or protuberance on the end, and this is thrust into the mouth. In order to work it the sheep must be set on its haunches or rump, with the shoulders resting between the knees of the operator's assistant, also letting him take hold of the fore feet to aid in keeping the patient quiet. Insert a gag, or keep the sheep's mouth open with the hand, smear the probang with lard or vaseline, then gently pass it over the back of the tongue, down into the gullet, upon reaching the obstruction you must only make use of the very gentlest of pressure, as violent efforts may cause lacerations of the parts, which are liable to fatally injure the animal. After the obstruction has been moved by the probang and passes into the rumen there will be immediate and complete relief. If considerable bloating is present, it is well to puncture the rumen prior to passing the probang, and this should be done with an instrument called a trocar. Select the part to be operated on and insert the trocar, withdrawing the stilet and leaving the tube in position, so that the gases may have sufficient time to escape through it. In bloat from choking in both oxen and sheep operate on the left flank, being careful to select the right place, taking the soft and most bulging points for a guide, so as to avoid striking the last ribs, or the transverse processes of the lumbar vertebra. If the operation is unsuccessful, the operator being unable to remove the obstruction with the probang, better slaughter the animal.

Bloat or Hoven, known also as *Blasting*, is a condition arising from malassimilation of feed rather than a disease. The cause is a collection and formation of gases in the rumen and first stomach, due to fermentation. Frosted roots, or top roots, and a diet containing a surplus of moisture, eating of grasses still wet with dew, are among the causes. It is also known to arise as a complication to choking, etc.

Symptoms.—Dullness; hard breathing; abdominal pain; body back of the ribs commences to enlarge, especially in the region of the left flank where the rumen is situated. On this side the swelling is more prominent and conspicuous than on the other.

Treatment should be guided by the cause and symptoms. Before resorting to the trocar, take incture of colchicum seeds and place twenty to thirty of them on the sheep's tongue, repeating it every twenty minutes, if required. If the colchicum is not at hand at the moment, bicarbonate of soda may be substituted; this, which is identical with our common baking soda, is found in all households and therefore often the remedy most easily accessible. Dissolve 1 tablespoonful in $\frac{1}{2}$ pint of water (warm) and administer as a drench. Should the bloating be severe you must resort to the operation with the trocar at once. Plunge it into the most prominent and bulging part of the left flank, so that the gas may escape, then give the colchicum or soda treatment to prevent fermentation of the viscera. Should the disease be due to partaking of wet grasses or too succulent a diet, correct this, substituting with a more dry ration, to which is added Davis Stock Food in the usual proportions. The early morning dew on the grass should be allowed to evaporate before the sheep are turned out.

Loss of the Cud is caused by functional derangement of some part of the system. If any serious disease is present the animal's craving for feed naturally more or less decreases, or ceases entirely, while as soon as recovery takes place the cud chewing will again commence as a natural consequence with the restored appetite and partaking of feed. No other treatment than a cathartic, as for instance, 4 ounces of Epsom salts, and 1 ounce of hyposulphite of soda, dissolved in 1 pint of warm water, is required. Such cases as are due to indigestion, which is shown by the sheep pulling and eating its wool, should be relieved by a mixture of prepared chalk and common salt sprinkled over the fodder. If Davis Stock Food is given with the feed this, as a rule, is all that is required in the way of treatment for cessation of cud chewing, known as Loss of the Cud.

Impaction of the Rumen is a distention of the rumen with feed; in other words, the organ becomes filled to its utmost capacity with solid feedstuffs, especially grain; or it may be encountered where sheep are grazed on new grass in stubble fields; sudden changing from poor to rich pastures; or in some instances new wheat has been productive of fatal effects. There is paralyzation of the walls of the rumen, their natural motion ceases, the feed remains in the viscus as an indigestible, inert mass, and death ensues if the proper treatment is not applied.

Symptoms.—Sheep is dull and stupid; the cud chewing ceases; there are frequent grunts attendant upon the pain; there is an anxious look in the face, and pressure on the left flank reveals a doughy, pitting feeling.

Treatment.—Give a cathartic, together with stimulants, as follows: Fluid extract nux vomica, 5 minims; Barbadoes aloes, $\frac{1}{2}$ ounce; aromatic spirits ammonia, 2 drams; warm water, 1 pint. Mix this thoroughly and give in one dose. If for any reason this treatment should fail in producing the desired effect, and the sheep is a valuable one, the owner desiring to save the animal for breeding purposes, call a veterinarian and have him perform the following operation: First clip the fleece in the region of the flank, next take a sharp knife, make an incision downward and inward through the skin from a point about 2 inches from the protuberance of the hip bone, making it about 3 inches in length to permit the hand to enter; break through the tissues underlying the skin with the fingers, laying bare the outside coats of the first stomach; now make an incision through this, reach in with the hand (first securing a napkin or clean cloth and placing it so that it covers the dependent part of the wound in the skin and stomach, in order to prevent the contents from falling down between the walls of the stomach and the abdominal cavity, which would in most cases be followed with peritonitis), and remove at least one-third of its contents. Thereafter a purgative should be poured into the stomach, a simple compound made up of 2 ounces of common salt, $\frac{1}{2}$ ounce

of solution of ammonium acetate, and 1 pint of water. This being done the walls of the rumen (stomach) should be carefully sewed up, a fine surgeon's needle, sterilized catgut or silk being employed, the stitches placed about $\frac{1}{2}$ inch apart, silk being used thereupon to sew up the skin. In the last part of the process be careful that the stitches do not include the tissues interspacing between the skin and the rumen. Pine tar should be used in dressing the external surface. Properly done, this is usually a very successful operation, and is not liable to result in serious consequences of any kind. Of course, if you do not know the animal anatomy well, you had better call in a veterinarian to perform it.

Wool Balls.

Little circular bodies of wool found in the first stomach of the sheep after death, and caused by the felting of wool and feed materials. Only when occurring in young lambs, immediately after the ewe has been shorn, are these apt to be of serious consequence, and ordinarily they cause but little inconvenience to the sheep. After the mother has been shorn, however, the ticks which formerly resided on her body remove to the lambs, causing them to bite and tear out the wool, considerable quantities of which are swallowed, followed by conditions which at times terminate fatally. The same holds good of mineral or other small bodies which become lodged in the bowels, such as, for instance, a nail head or a piece of gravel; although they may form pouches or depressions, little injury to the organs is done except when, in some way or other, they become dislodged and ejected from their pouches, when colicky symptoms of fatal consequence may ensue.

A very common and but slightly dangerous or inconveniencing disease of the sheep.

Umbilical Hernia.

Treatment.—In rare instances where the animal is found with rupture threatening its life through strangulation, it is better to dispose of it to the butcher. Operations for Umbilical Hernia are useless, and as the disease, although it does not improve the appearance of the sheep, is rarely serious, it is better to leave it alone altogether.

Stricture.

Changes in the tissues of the bowel attendant upon acute inflammation of its walls occur at times in the sheep. As it is always fatal, no treatment being devised to stay it, and as it is of comparatively rare occurrence, it deserves but passing notice in a work like this.

Impaction of the Fourth Stomach of Lambs

is a common and generally fatal disease, caused by milk curdling. It is usually brought about in the owner's attempt to force the lamb for the early spring market, cow's milk being fed it together with that of its mother. The symptoms of the disease manifest in the lamb appearing dull, stupid and unwilling to move. The breathing is quick and heavy, the belly is tender and swollen, and the bowels are more or less constipated.

Treatment.—A thin gruel to which is added bicarbonate of soda should be administered; 10 grains of the soda in every dose of gruel being given, and the gruel administered every two hours in portions of about 3 ounces. You may follow this treatment with linseed oil in the following way: Aromatic spirits of ammonia, $\frac{1}{2}$ teaspoonful; linseed oil, 4 ounces. The dose should be well shaken before administered.

Colic

is not a very common disease among sheep. If, however, colicky pains are present, evidenced by grinding of the teeth, striking the belly with the hind feet at intervals, etc., it indicates that colic is the cause, the condition being more frequently encountered in lambs than in sheep; a faulty diet, as, for instance, overfeeding from the bottle, using cow's milk, or surfeit milk of any kind, even though it comes from its own dam, being generally the fault. As treatment, antispasmodic and carminative agents should be resorted to, peppermint, ginger and sulphuric ether being very beneficial. Then resort to counter irritation, applying a stimulating liniment to the belly. There is nothing better than Davis Veterinary Liniment. Also give a good cathartic and give Davis Colic Cure, two tablespoonfuls dissolved in water at a dose being the proportion suitable for a lamb about three months old; other animals should be given the treatment in proportion to their age. Generally this will bring instant relief, and if in severe cases a rectal injection of soap and warm water is added all colicky pains will disappear.

Inflammation of the Bowels, or Enteritis, is rarely met with in sheep, and it is doubtful if it really exists as a special disease or is merely the consequence of other systemic troubles, some authorities even affirming that it is an open question if the disease in its true nature ever occurs in the sheep. The indications denoting the presence of enteritis, in the form in which it may show, are essentially the same as those encountered in colic, with the addition that here the patient is inclined to lie down most of the time, the pain is continuous, while in colic it only appears at intervals and the temperature remains elevated until the end of the attack. Around the mouth a frothy saliva may collect, and the belly is tender to the touch, at times painful.

Treatment should consist of stimulating applications to the belly, such as Davis Veterinary Liniment. A mustard plaster applied after the fleece has been removed is also good. In more severe cases quinine and opium combined, or camphor and belladonna will prove beneficial and relieve the pain. Never administer purgatives for this ailment. Instead of water, mucilaginous fluids should be given to drink, and during the convalescence Davis Stock Food, 1 heaping teaspoonful to each feed, should be given as a tonic and strengthener. The following is a preparation which in the majority of cases of this nature will do the work: Laudanum, 1½ ounces; spirits of camphor, 6 drams; fluid extract belladonna leaves, 2 drams; alcohol, 6½ ounces; thoroughly mixed and given in doses of 1 tablespoonful in ¼ pint of warm gruel every three hours. Also give the usual counter irritation in the way of an external application to the belly; mustard and the like is good.

Diarrhea, also called Superpurgation, is a well known disease, a fluid condition of the contents of the stomach and bowels, indicating either faulty diet, water, or some kind of functional disturbance of the system. There is an increase in the peristaltic action of the organs, due to some kind of irritation. Great thirst is evinced, and if this is not controlled it will further enhance the trouble. An abrupt change from one kind of feed to another, wet, unripe grasses, marshy meadow grasses, forming a watery diet, as well as all kinds of exposure to storms and rains favor the condition. It may also be present as a secondary symptom of some other disease, such as tuberculosis, diseases of the liver, local tissue changes, etc. One of the most common complications is dysentery, and it often results in an attack of this trouble.

Symptoms.—A fluid condition of the feces; frequent evacuations. As disease progresses the bowels become injected, causing colicky pains; quick pulse, which generally weakens; the temperature lowers rapidly; there is great thirst; emaciation; anxious expression; furred tongue; cold extremities as the end approaches; the mucous membrane turns pale instead of its healthy pink. These are symptoms of the worst form of the disease; they indicate neglect on the part of the owner, and often terminate fatally. To counteract this condition the animal should be put on a dry, yet nourishing ration, and Davis Stock Food given in the usual proportion.

Diarrhea in Lambs. In lambs the disease is also called the White Skit, the name coming from the profuse, white colored feces. The trouble is caused by increased peristaltic action, the milk being either too rich in quality or partaken of too freely, causing it to coagulate too quickly on account of the increased powers of the gastric juices. The period when the lamb commences to take other nourishment together with the mother's milk is especially favorable for the development of this disease.

Symptoms.—Dullness; heaving of the flanks; tense enlarged condition of the abdomen; sometimes costiveness; a peculiar white color of the feces. Besides this diarrhetic disease in lambs they are subject to another form of the affection called the Green Skit, in which the fluid evacuations of the bowels are of a greenish color. This is a very dangerous condition and may terminate fatally in the course of a day or two.

Treatment of Adult Sheep.—The first thing to do is to keep the animal away from the water; do not allow anything but bland fluids, such as linseed or rice tea, flour, gruel, etc. Warm, comfortable quarters should be provided; look after the cause of the trouble and remedy it. In case of excessive thirst,

give the following: Baking soda, 1 ounce; water, 1 gallon; permit the sheep to quench its thirst with this. In order to correct any sourness or acidity that may be present in the stomach administer the following compound: Give Davis Stock Food as directed or in its absence try this: Tincture of ginger, 1 ounce; laudanum, 4 ounces; peppermint water, 8 ounces; prepared chalk, 1 ounce; mix this thoroughly and give the patient 2 or 3 tablespoonfuls night and morning. Lambs recently weaned should be given about half the dose. A very important part of the treatment for diarrhea is correction of the diet; remove the animal to drier pastures if possible, feed it on dry feedstuffs, such as bran and hay. A teaspoonful of Davis Stock Food in each feed will do no harm. It is well to try to stop the diarrhetic condition at the outset, with a treatment consisting of linseed oil and Davis Scour Cure, the latter remedy being a panacea for this condition.

Treatment for White Skit.—The thing is to endeavor to dissolve the solids in the fourth stomach, for which alkalies are recommended. Prepare the following: Baking soda, $\frac{1}{2}$ ounce; tincture of ginger, 1 dram; warm, thin gruel, 4 ounces; sulphate of magnesia, 1 ounce; mix this thoroughly and administer in one dose. You may then give a cordial mixture, the following having been tried with good results: Tincture of catechu, 2 ounces; magnesia, 1 ounce; tincture of rhubarb, 1 ounce; bicarbonate of soda, 2 ounces; glycerine, 2 drams; water, 12 ounces; mix this thoroughly and give the patient from $\frac{1}{2}$ to 2 tablespoonfuls three times daily, in conformity to its age. When the lamb is still sucking the ewe it is well to look after the diet of the mother in connection with the treatment of the offspring. Keep her milk in a healthy (not too rich) condition by feeding on dry rations, and at the same time you may administer the preceding mixture to her twice a day, giving her 3 to 4 tablespoonfuls. When this is done, however, the direct treatment of the lamb should be reduced materially. In the treatment of Green Skit, present in lambs who have just left off sucking, the cordial preparation which we have given above should be administered, 1 tablespoonful every three hours being the correct dose. Small doses of whisky as a stimulant in emergency is of great assistance.

Dysentery, Cling, also called Bloody Flux, is generally caused by the feeding of coarse, unwholesome feed, or from grazing on low and marshy lands, especially such as have been submerged in water, when the sand grit and decaying compositions of plants set up inflammation and irritation of the bowels. Dysentery is an inflammatory disease, affecting the membranes of the large intestines. It often terminates fatally. Some form of typhoid fever like symptoms; with fluid evacuations from the bowels, mixed with large quantities of mucus and blood, characterizes the disease.

Symptoms.—Physical exhaustion; profuse diarrhea; feverishness; low temperature; feces are thin but adhesive, painful and laden with mucus, and often accompanied with blood; belly is swollen and tender to the touch; watery feces adhere to the wool and tail, also to thighs; flies pester the sore spots and maggots develop in their trail; there is excessive thirst; appetite is often ravenous in spite of the emaciation and weakness. Attack may last for weeks, or death may result in a few days. Sometimes the wool becomes matted over the rump so that evacuation of the feces becomes difficult or impossible. If this condition, called binding, is not remedied it will gradually cause death as the fecal matters cannot be expelled. Remove the wool on the rump and thigh, wash with warm water and soap, and keep the parts clean, in order to avoid this condition. To prevent the attack of flies, spray the animal with Davis Fly Chaser two or three times daily, or in its absence prepare the following powder: Calomel, 1 dram; subnitrate of bismuth, 2 ounces; iodoform, $\frac{1}{2}$ dram; mix it thoroughly and dust on the affected parts. You may substitute it with a solution of oil of tar and turpentine, being less expensive and just as good. Prepare it as follows: Oil of tar, 1 ounce; spirits of turpentine, 1 ounce; spirits of camphor, 2 ounces; neatsfoot oil, 4 ounces. Dry feeds, such as a ration of bran and oats, mixed in with a little linseed meal, are good. At the onset of the affection it is well to give the patient 4 ounces of linseed oil. Follow this up with small doses of the same oil during the treatment. It is very important that the animal should be well housed and kept in comfort and quiet during the progress of the disease. Rhubarb, ipecacuanha and laudanum should be given with the linseed oil as follows: Tincture of rhubarb, 1 ounce; linseed oil, 9 ounces; wine of ipecac, 1 ounce; laudanum, 2 ounces; mix this thoroughly and give 2 tablespoonfuls twice daily. Pure beechwood creosote in drop doses is recommended where the discharges are

offensive. When the animal has been brought around to the convalescing stage the feeding should be very careful, and the digestive and assimilative functions should be kept in proper working order by the use of Davis Stock Food, 1 teaspoonful to each feed, this acting also as a tonic and stimulant. If this is not at hand, use the following tonic: Powdered gentian root, 4 ounces; powdered saltpeter, 1 ounce; linseed meal, 8 ounces; powdered sulphate of iron, 3 ounces; powdered nux vomica, 3 drams; mix this thoroughly and give the sheep 1 tablespoonful to each feed twice a day. In the spring of the year you will do well in tagging the sheep, which means to remove the tags of wool hanging around the breech, in order that they may be safe from the pestiferous flies if scouring should set in.

Constipation. In the grown sheep this is a condition due to too much dry feed taken into the stomach. In lambs, gastric troubles may be the cause. Impaired peristaltic action may also produce it, this again being a reaction from defective or weakened nerve force, causing the mucus in the bowels to dry up, this again making it impossible for the feces to glide through the passages.

Treatment.—In the case of the grown sheep, first give an injection of warm water and soap, or warm linseed oil, glycerine also being excellent for this purpose. As internal treatment, prepare the following: Tincture of ginger, 1 dram; Barbadoes aloes, $\frac{1}{2}$ ounce; linseed oil, 6 ounces; mix this thoroughly and give it in one dose. Animal fat, such as pure, warm hog's lard, is the best remedy to administer to the lamb. If this works too slow a rectal injection of warm milk may be administered, adding a quantity of molasses, enough to give the compound the color of chocolate. In order to effectually administer it you may suspend the lamb by the hind legs, insert the syringe, the animal held in this position for a little while (not too long), and then given its liberty. The result as a rule will be immediate. In cases where a new born lamb is affected, it is best to treat it through the medium of its dam, giving the ewe the cathartic drench above mentioned. Remove all fecal matter from the rectum of the patient, both in the case of the adult sheep and the lamb. Use a small injection of oil for this purpose, then oil the fingers also and remove all obstructions found in the passage.

DISEASES OF THE LIVER.

Such diseases are especially indicated by the characteristic yellow appearance they impart to the membranes, more prominently shown on the lining of the eyelids (conjunctiva). It may be of interest for you to know that the liver of the sheep constitutes no less than one twenty-fifth part of the entire weight of the animal, being much heavier than the organ of the human being.

Acute Inflammation of the Liver, also called Hepatitis, is most often met with in sheep grazing on low lying lands, where the ground is marshy and wet, the grasses high and rank, and the soil sandy or clayish. Overnutrition is said to be the cause of the affection. The disease generally originates as an attendant upon inflammation of some of the surrounding organs.

Symptoms.—Signs of fever are present; the visible membranes are of a yellowish, sickly appearance, which is caused by the amount of bile present in the blood vessels.

Treatment.—Bleeding is recommended. Open the jugular vein and extract a few ounces. Reduce the diet of the patient, and prepare a cathartic as follows: Bicarbonate of soda, 1 dram; Glauber salts, 4 ounces; common salt, 1 ounce. Mix this up with a sufficient quantity of warm gruel and give it slowly as a drench. After the action of this purgative you may prepare and use the following compound with good effects: Alcohol, 2 ounces; sulphuric acid, $\frac{1}{2}$ dram; fluid extract of gentian, $\frac{1}{2}$ ounce; water, 8 ounces. Mix thoroughly and give 1 tablespoonful twice daily half an hour before the feeding of grain. This mixture is unnecessary, however, if Davis Stock Food is used. Grain should be fed sparingly to sheep suffering from this affection, the best ration being a small feed twice daily of oats and bran, $\frac{1}{2}$ pound of each, to which is added Davis Stock Food, 1 teaspoonful to each feed.

URINARY DISEASES.

Renal Calculi

consists in stony or gravelly deposits in the urinary organs, the kidneys and pelvis. Analyzing them we find that they, as a rule, are composed of phosphate of lime. If these calculi are confined to the kidneys they seldom cause any noticeable harm or disturbance of organic function, but if they find their way into and become lodged in the ureters, a retention of urine in the bladder is often produced, and serious results follow. However, cases of this nature are rare in sheep. Located in the bladder proper they seem harmless, and it is only when they descend into the urethra and obstruct the passage that retention of urine with attendant inflammation results, and a fatal termination may be looked for.

Urethral Calculi.

As indicated, urethral calculi are stony deposits which lodge in and obstruct the passage of the urine, causing it to accumulate in the bladder, which is generally followed by distention and subsequent rupture of the organ, with a filtering through its walls into the surrounding tissues, resulting in inflammation and death.

Symptoms.—Inability to void the urine; hurried respirations; sheep grunts frequently; restlessness; uneasiness; patient prefers to remain in a recumbent position; if forced to rise, back is suddenly curved and a few drops of urine are passed; when the water accumulates in the bladder patient becomes stupid, there is abdominal pain; temperature is elevated; membranes become red and congested; uremic poisoning results, which is quickly followed by death if a passage of the urine through the penis has not been forced in some manner.

Treatment.—An operation is necessary. Set the patient on its rump, then carefully examine the skin over the end of the penis, called the prepuce, which, if the disease is urethral calculi, will be found enlarged and inflamed, while the tissues of the belly also will be found protruding, hot, and inflamed, in cases which have been allowed to go on for some time. You should, if you find this condition present, push back the prepuce and draw out the penis, and upon examining its worm like extremity you will generally find indications of a sediment which obstructs the passage. It may be in the form of fine sand or gravel, and should be removed at once; where it is of a gravelly nature, it is, as a rule, necessary to remove the entire appendage, while, if the deposit is of a finer character, careful manipulation, as a rule, will remove it. Before anything else is done you should apply warm water, in order to soften and relax the tissues. If the obstruction consists of a sabulous material, deposited on the lining membrane of the urethra and extending some distance from the appendage, it is sometimes necessary to cut down and remove this deposit, which is done by making a longitudinal cut in the penis through the urethra, opening it from above downward to the vermiform process. On wethers this operation is very successful, but it often unfits rams for breeding purposes, at least this is claimed by some authorities, while others hold that it causes no serious injury to the animal in any way. If the operation on the penis is unavailing it indicates that the obstruction is located not only in the urethra, but in the kidneys, bladder and ureters as well, and if this be so, no treatment will be of any use, and you had better kill the animal, the meat in this case being unfit for human consumption, as the urine which has impregnated the belly and surrounding tissues taints the whole body. You should carefully inspect the diet of your sheep if you find that a number of animals show symptoms of calculi. Change the ration and administer carbonate of potash, keeping the digestive and circulatory functions working smoothly by the use of Davis Stock Food in the prescribed quantity in each feed. Mangolds and beets, fed in excessive quantities, often cause urethral calculi in sheep, and if you find this to be the cause in your flock, by all means change the ration immediately. As an internal treatment, where the disease has been contracted, prepare and administer the following compound: Potassium carbonate, 3 ounces; fluid extract of belladonna, 1 ounce; water, 1 pint. Mix this thoroughly and give the patient 1 tablespoonful three times daily, this being the quantity for the grown sheep, younger animals being given a proportionate dose. Small doses of Sanmetto, 1 teaspoonful three times a day, is also a good remedy for all urinary diseases in

sheep. After you have performed the operation on the penis, removing the gravel, use the following as a dressing for the wound: Distilled extract of witch hazel, 1 ounce; fluid hydrastis, 2 drams; water, 3 ounces. This will prove very soothing and beneficial and may also, if necessary, be injected into the passage (urethra).

DISEASES DUE TO INTERNAL PARASITES.

Sturdy, Gid, Turnsick.

A larval tapeworm in the brain substance is responsible for this affection, the parasite being imbedded in the organ and denominated *coenurus cerebralis* in technical language. Ingestion by the animal of the eggs of a certain species of the tapeworm family called *taenia coenurusa*—a parasite which has been distributed on the ground, or in the water of which the patient drinks, by other animals, on the plains the fox, wolf or coyote, and on the farm the dog—produces the germ from which the disease arises. The use of sheep dogs is especially responsible for the trouble. After the minute eggs of the tapeworm have been swallowed they hatch within the stomach of the sheep, and then pierce its walls, gaining access to the circulation of the system. In turn they are carried on to the various parts of the body, and those which on the trip reach the brain and spinal cord, imbed themselves there, growing into cystic bodies, continuing to thrive and develop, feeding upon the vital tissues of these organs. Others of these germs may reach the lungs, heart and diaphragm, where they locate temporarily, disappearing, however, after a little while without causing any noticeable disturbance. The parasites locating in the brain substance often in the course of from two to four months' time grow to the size of a hazel nut, seriously obstructing the functions of the organs, which again reacts upon the general health of the animal. If a dog partakes of the head of a sheep infested with these parasites, the organism lodged in the brain tissue develops into adult tapeworms, and the dog in turn deposits the eggs on grasses, etc., which are eaten by the sheep, these once more developing hyatids, thus keeping up what may be termed an endless chain of the disease.

Symptoms.—The earliest symptoms are dullness; stupidity; erratic movements; staggering gait; giddiness; patient often tumbles over; rumination is imperfect; animal may be grazing quietly and suddenly jumps into the air as if in fright; congestion and inflammation of the brain which houses the young parasites is undoubtedly responsible for these symptoms. The first stage may be followed with a few weeks of seeming health, the cyst or cysts, however, continuing to grow and expand in the brain tissues, interfering with the circulation of the blood in those parts, and at this stage the cyst on its surface is covered with protruding heads, causing irritation. The advent of the next stage is preceded by the animal growing weak and emaciated; this condition aggravates; the appetite vanishes; sheep stops feeding; there is an anxious, haggard look in the face, due to blindness; blindness may occur in one or both eyes, depending upon where the parasites are imbedded; rumination is suspended; sheep continually moves in a circle; if the spinal cord is infested, sheep staggers and walks without control of posterior limbs; intense itchiness may be present along the backbone, and complete paralysis of the posterior part of the body, including the rectum and bladder, often results.

The disease should not be confounded with grubs, an affection in some ways resembling it, being caused by the gadfly's larva and located in the nasal and frontal cavities. You may distinguish between the two by the catarrh and sneezing produced by grubs, and the absence of the more violent symptoms present in sturdy.

Treatment must be in the form of prevention mainly. Give vermicides to your dogs, especially those frequenting the same places as the sheep; keep the sheep as much as possible away from places frequented by dogs, and where they are likely to pick up the eggs. Also be careful to protect your flock from coming in contact with the voidings of strange dogs. Never feed the heads of diseased sheep to dogs, but burn or bury them deeply at once. It is also shown that with an improved general health

of the sheep, such as attends upon the feeding of Davis Stock Food regularly with the ration, the attacks of this disease are of less frequent occurrence, the reason being that the purer blood and freer and healthier circulation, with corresponding increase in vitality and strength enables the system to expel parasites and withstand their attacks much better. It is therefore well for you always to have Davis Stock Food at hand, feeding it in health and disease. In hundreds of connections it will be worth its price over and over to you, insuring against disease, keeping the stock healthy and robust, and saving the lives of valuable animals among the sheep as elsewhere. Animals which have been exposed to inclement weather are especially liable to be attacked with the disease, the nervous system being weakened by the exposure. If a number of sheep become affected at the same time, it is reasonable for you to suppose that the pasture in which they graze is infested, and the flock should henceforth be carefully watched in order to get rid of the trouble. Any animal which is fat and shows the least indication of being affected should be disposed of for meat. Treatment by trephining the skull and puncturing the sack has been successfully performed in a number of instances, but should be done by a skilled veterinarian.

Parasitic Catarrh of the Nose. Caused by a fly known as the gadfly, which invades the nasal cavities, depositing its larvae inside the nostrils. The gadfly looks very much like a large house fly, and in flight it is so quick as to be almost invisible. Its color is dull lead. In depositing its larvae in the cavities of the nose, the embryos soon after proceed to crawl up the membranes, infesting the frontal and maxillary sinuses. The female gadfly is supposed to deposit not her eggs, but live larvae within the nose of the sheep. This minute larva as it matures changes in appearance, attaining a considerable size (something like three-quarters of an inch), the body being dark and striped with black bands, the spines also turning black. At this point the grub loosens from the nostrils of the sheep and falls to the ground, immediately digging down into it. Here it remains for one or two months' time, depending upon the weather, after which, when the fly is matured within its shell, it pushes open the upper end of the case and emerges from the ground by the same hole the larva made in digging into it. Then as soon as the fly arouses from its comatose condition and gets used to the light it is off immediately in search of a convenient flock of sheep.

Symptoms.—One sheep may be seen of a sudden darting into the middle of the flock; its nose is kept close to the ground; it shakes its head violently; it tries in vain to evade its pursuer; the whole flock becomes nervous although only a single fly be about. Every member places its nose close to the ground, huddling together as much as possible to prevent the fly from gaining ingress. After the larvae are deposited great irritation becomes evident, due to their inserting their hooks and spines in drawing themselves up and along the nasal room. Minute hemorrhages, looking like small black pin-head points, are left all along their wake. As they grow in size in the sheep's head, it becomes affected with catarrhal discharge, first clear, then thick and muddy with mucus. Other symptoms are sneezing, with expelling of quantities of mucus and sometimes matured larvae. Sheep is inclined to lie down, nose pointed into the air, turning its head around and backward; eyes become red and watery; patient moves about with nose close to the ground, lifting the hind legs high, raising head to the wind and bending it sharply backward; giddiness may seize it with attendant staggers, and there is a loss of rest and feed. The attack may last all the way from one to ten months, depending on the quickness with which the larvae mature in the nostrils. A single sheep may be infected over and over again, the result being a whole little colony of larvae of different ages and size existing in its nose. The months of June and July are the most favorable for infection, the gadfly being a warm weather insect.

Treatment.—Smear the nose of the patient with Davis Fly Chaser, or in its absence, a compound of grease and tar, equal parts, using a brush for its application. It is well to apply this treatment to the whole flock throughout the warm weather season, and the application should be renewed once a week. It is at best not easy to protect a large flock of sheep from the little pests. A good plan is to herd them throughout the hot part of the day on ground where dust is easily raised, as the flies do not relish this and are likely to keep away if dust fills the air about the sheep. In case of a valuable animal which you desire to preserve for breeding purposes, and its life being in danger from the number of larvae in the nose, a surgical operation is advised, by which it is possible to remove the pest, but as this requires the attendance of a veterinarian, we shall not go into a description of it here.

Parasitic Diarrhea is produced by irritation of the mucous membranes of the alimentary canal, due to the presence of tapeworm, technically called *taenia expansa*. It is one of the worst affections in the sheep family, often fatal, and to be found in the sheep flock anywhere. Serious loss is sustained by the owner as a consequence. Very often in cases of diarrhea in sheep and lambs segment of tapeworms may be found in the fecal discharges on examination, and in one severe outbreak of the disease in New York it is recorded that the intestines of the lambs succumbing were found full of tapeworms, reaching as long as fifteen feet. If you have cause to suspect that your flock is infested in this way you may confirm your suspicion by examining the soil on which they are folded after a heavy rain, when you will come across segments of the worms, washed free from the fecal matter by the rainfall. The disease occurs in a large part of the United States. The parasite is from 5 to 6 yards long and from 1-25 inch in breadth at the head to $\frac{1}{2}$ inch at the tail, this being its largest known measure. Head as a rule is small and pointed, neck short, almost merging into the body, first segments are very short, then going backward to the tail they broaden and lengthen by degrees. Four suckers project from the head, which at the end is very small, body of the parasite is composed of segments of varying length and very wide and flat. Color of the worm is dull white, which becomes transparent if submerged in water for a while. The segments are each provided with their own set of genital organs, containing eggs or young embryos, making it possible for them to reproduce independently of each other. As the embryo develops within the segment it matures, and finally separates from the mother worm to be expelled on the ground with the excrement. The segments located nearest the tail mature first and are the first to be shed, the others following in turn until nothing but the head remains, making it possible for the lamb to recover from the trouble after all the segments are expelled.

Symptoms.—Feces are yellowish in color and slimy, often containing segments of the tapeworm, which may be found if looked for; digestive functions become deranged; rumination is imperfect; breath becomes fetid; colicky symptoms manifest at intervals; constipation may be present between whiles; fleece is dry and brittle; belly becomes distended owing to gas or accumulation of fecal matters; skin is pale, and visible membranes, such as lining of eyelids, appear bloodless; the animal becomes emaciated; convulsions set in, followed by malignant diarrhea, refusing to yield to treatment; the animal in fatal cases finally dropping down upon the ground, unable to regain its feet, dying from weakness and debility.

Treatment should be preventive rather than curative. Dose the whole flock if you suspect that tapeworm is present, since the well sheep are sure to pick up the eggs of the parasite expelled by the ones affected, thus contracting the disease. Treat your sheep in the following way: Do not administer the vermifuge until you have kept the entire flock without feed and water for twelve to twenty hours. Then dose all of them with Dr. Goodard's Worm Powders as directed, and keep them locked up for the next twenty-four hours, so that the segments and eggs voided may not be distributed over the pastures where they are wont to graze. After you feel sure that the treatment has had the desired effect, liberate the sheep, and cover the inclosure in which they were confined with quicklime in order to destroy all living matter in the feces voided. One of the simplest and surest of remedies for this kind of tapeworm is Dr. Goodard's Worm Powders, obtained in either 1 or 3-pound boxes. The dose for the adult sheep is 3 drams, which, before it is administered, should be thoroughly mixed in ten times the amount of feed. Lambs should be treated to a dose according to their age, from 1 to 2 drams being the average. Give the dose with the feed both to the grown sheep and the lamb. In the absence of Dr. Goodard's Worm Powders try castor oil, 4 ounces; ethereal extract, male shield fern, 1 dram. Mix it thoroughly and give it as one dose to each adult sheep; lambs you may with safety give from one to three-fourths of the above, according to their age and size. After this treatment be sure to include Davis Stock Food with the feed ration, 1 teaspoonful to the adult sheep, and $\frac{1}{2}$ teaspoonful to the lamb, as a tonic and digestive is very much needed to restore the health of the sheep and overcome the weakness and debility attendant upon the disease. The stock food treatment should be kept up for some time; in fact, you may with advantage use it right along; it will make your entire flock of sheep healthier and stronger, better to look at, of greater value, and almost impervious to any form of disease. If, for any reason, you should not have Davis Stock Food at hand you may substitute by preparing and

administering the following tonic: Sulphate of iron, $\frac{1}{2}$ pound; powdered gentian, $\frac{1}{2}$ pound; Epsom salts, 1 pound; nitrate of potash, 4 ounces; common table salt, 2 pounds. Mix this thoroughly and administer it with the feed, mixed into this. The proportion given is enough for fifty sheep. Repeat the treatment three times a week until the animals show signs of recovering from their weakened condition. In trying to prevent the disease, the first thing is to remember not to overstock the pastures where the sheep are grazing. Lambs should always, when possible, be confined to fields which have not been used as grazing lands for several months past. You should also be careful about the water supply, as this often is a fruitful source of infection. As this is largely a summer disease, you should be especially careful to take preventive measures during this season. Also bear in mind that the majority of fatalities resulting from this disease occur in lambs under six months of age. Remember that after the lamb has been treated for the trouble and gotten rid of the worms it is weak and debilitated and should receive especial care and attention, $\frac{1}{2}$ teaspoonful of Davis Stock Food being given it in each feed to stimulate its appetite and build up the general system. The same, as already mentioned, is the case with the grown sheep.

Parasitic Gastric Catarrh is due to round worms, *strongylus contortus*, in the fourth stomach. It is an affection common in the sheep family of all countries, and is often fatal, especially in the lamb. It may be complicated with verminous bronchitis, and is most often met with during the spring and summer months. It is a common affection all over the United States.

The male worm is from $\frac{1}{2}$ to 1 inch long, the female from 1 to $1\frac{1}{2}$ inches, the body terminating in a pointed tail. The vulva is situated a short distance from the tail in a depression covered by a powerful tongue like appendage; the eggs are ovoid and very small in size, invisible to the naked eye. Body of the worm is red or white, depending upon whether its intestine is filled with blood, sucked from the membrane of the stomach, or empty. Sheep probably are infected with this parasite through the water they drink. Muddy water is a favorite developing place for the parasite, and from there it enters the stomach of the animal, being taken in with the water it drinks, and quickly matures in its stomach. You should therefore be very careful not to allow your sheep's drinking water to be contaminated with the voidings of animals suffering from these parasites.

Symptoms.—Dullness; depraved appetite; great thirst; emaciation; enlarged and tense belly; attacks of colic at intervals. Death usually follows a black diarrhea which attends the worst form of the disease. Upon examination after death, the fourth stomach of the patient will be found to contain hundreds or thousands of twisted round worms, packed solidly together, heads embedded in the membrane of the organ, which is very pale, bloodless and thick, indicating the ravages of the pests.

Treatment.—Dr. Goodard's Worm Powders are practically a panacea for this disease, both in the adult sheep and the lamb, as experiments conducted both by ourselves and others have demonstrated this remedy to be one of the safest and surest means of relieving the patient from the parasite, if used in careful accordance with directions. They are easy to administer, economical, and a positive cure. A very simple remedy in cases where large numbers of sheep are to be treated, and none of the vermifuges mentioned are at hand, is pumpkin seed. They can be given in unlimited quantities, and often produce very satisfactory results. You may mix them with the dry feed, as, for instance, shorts, the drawback in using this simple remedy being that it is very hard to get the sheep to eat a sufficient quantity of the mixture. If it fails, resort to one of the other preparations, Dr. Goodard's Worm Powders preferably. After the treatment put the sheep upon fresh grazing grounds, and do not use the pastures where they used to graze for at least two seasons, a salt or lime dressing being administered to the infected fields if practicable. A new and apparently very successful treatment for this disease is the use of gasoline, administered as follows: Give lambs, weighing from 60 to 75 pounds, 1 tablespoonful of gasoline in $\frac{1}{2}$ pound of linseed tea or oatmeal gruel, repeating daily for two or three days. The dose for adult sheep is from 2 to 3 tablespoonfuls, administered in the same way. It may be tried without danger of injury. After treatment, when the animals have been put on new feed, allow all skinny and emaciated members the regular dose of Davis Stock Food with a nourishing feed ration of bran and hay, etc.

The Rot.

This is possibly the most dreaded disease of the sheep family. It is feared by the experienced breeder, and is more common and fatal in its tendencies than all others combined, scabies probably excepted. Undoubtedly wet, swampy and marshy soil is to a large extent responsible for the appearance of the disease, and it has been recorded since hundreds of years as following the annual inundations of the Nile in old Egypt. The parasite causing the affection is called the distoma hepaticum or liver fluke, and assumes its most serious character after heavy rains and extensive floods. It may affect animals of various ages and during all seasons.

Symptoms.—The early symptoms are uncertain; animal seems to gain in weight and appetite rather than fall off, the assimilative powers being sharpened, due to the increased flow of bile liberated by the operations of the young liver flukes in the liver and bile ducts. It is claimed that this phenomenon has been taken advantage of by noted sheep breeders, and that in order to fatten their sheep for the early market they have voluntarily exposed their animals to the disease. Dullness and a pale appearance of the membranes of the eyelids, mouth and nose, are among the early symptoms indicating the affection. Then, as it progresses, sheep becomes flabby about the loins and commences to shrink, color of the skin changes from the healthy pink of the normal sheep to a pale red; wool parts easily from the skin; the face is pale; in passing the hand over the hips a crackling sound is produced; the skin, as the disease further progresses, is covered with yellow and black spots; dullness is more pronounced; emaciation sets in; paleness of the membranes is more and more conspicuous, they at length becoming almost white, then turning yellow from the bile in the blood; skin also gradually turns yellow; it becomes loose and flabby; a watery fluid substance collects under it; there are pronounced swellings, especially under the belly, between the fore legs and under the jaw. When this stage, in which a large watery swelling under the jaw, giving the sheep the appearance called chockered, is arrived at, little or nothing can be done and death swiftly relieves it. The time for the development of the disease may be nine months or even fifteen months, during all of which the flukes reside in the affected animal. They then enter the intestinal canal and pass out of the body with the feces. It is even claimed that instances have occurred in which the disease lasted six years, the probability being that the parasites generated and through several generations succeeded in keeping their residence in the sheep. The usual time, however, is three to six months. Affected animals also have been known to succumb from an attack in a few days, due to inflammation of the liver. Thus it is impossible to give any exact time limit for the run of the disease. The patient always becomes greatly weakened by degrees, as the trouble gains headway, and other affections are likely to gain inroad upon them as a consequence of this.

If an examination after death is made, the disease being well advanced at the time the animal is killed or succumbs, it is found that the flesh is of a pale color, here and there infiltrated with a yellowish serous fluid; few parts of the body are exempt from evidence of the disease in advanced cases; the lungs are often full of tubercles, heart pale and soft; liver always extensively affected, pale in color, with a fluid, jelly like deposit on various parts of its surface, especially about the bile ducts; channels will be found in the substance of the organ, hidden under its membranes, and visible to the eye. The appearance of the liver fluke is about as follows: Body flattened leaf like, of a pale brown, irregular color, the adult being from 18 to 31 mm. long and from 4 to 13 mm. wide, oblong, oval or lanceolate, larger and rounder in front, where it is abruptly contracted in such a way as to present a conical neck, attenuate and obtuse behind, skin bristling with numerous little points directed backward. Oval sucker terminal rounded; ventral sucker large, projecting with a triangular opening, situated about 3 mm. behind the first. Intestine with two ramified branches visible through the skin, and of a deep shade. Eggs brown or greenish ovoid. This description in essence is made by Neumann, a noted authority upon the subject. The parasite has been found in the livers of sheep, goats, cattle, camels, and wild ruminants; also in the horse, the ass, the pig, the elephant, the rabbit, and man. It usually makes its residence in the bile ducts of the liver, feeding on the blood from the membranes of those passages. Here it deposits its eggs, from which they pass into the intestines and subsequently are voided, being expelled from the body with the feces.

Treatment must be preventive, as a perfect cure when the disease once has gained foothold is almost out of the question, although Davis Stock Food will at times effect a cure. The following rules, formulated by a specialist in this disease, are good and should be observed:

All eggs of the liver fluke must be vigorously destroyed. Manure from rotten sheep or infected animals must not be put on wet ground. As the liver and the intestines contain the eggs, those, too, must be destroyed. The manure of affected animals should not be stored where there is drainage from it to the neighboring grass. It should be mixed with lime and salt before being spread on meadows or cultivated lands.

If sheep are infected let them be sent to the butcher at once, unless they are specially valuable and are not badly affected. If kept they must not be put on wet ground.

Care must be taken to avoid introducing eggs of the fluke, either with manure of fluked sheep or in any other way. Rabbits and hares must not be allowed to introduce the eggs.

All heavy and wet ground must be thoroughly drained.

Dressing of lime and salt (or both) should be spread over the ground at the proper season to destroy the embryos, the cysts of the fluke and also the snail, which act as hosts.

Sheep must not be allowed to graze closely, for the more closely they graze the more fluke germs they will pick up.

When sheep are allowed to graze on dangerous ground they should have a daily allowance of salt and a little dry feed.

Medical treatment is of but little avail. The old breeders of Scotland and England have found their only relief in a good stock food and unless the disease is too far advanced Davis Stock Food will usually effect a cure if the feed of it is doubled or trebled. Salt evidently is destructive to the fluke, and should therefore constitute part of the sheep's ration. Always have a quantity of rock salt on hand. Together with this it is of the greatest importance to put the patient on a nourishing, strengthening diet. Barley, corn, oats, peas, dry grains and oil meal cake are all good, and if you feed any of these, or a combination of these, always including 1 tablespoonful of Davis Stock Food in each feed, you will increase the health and vigor of the patients 50 per cent, and enable them in many cases to successfully pull through the attack. Properly proportion the ration and avoid feed of a watery nature. The great advantage in the feeding of Davis Stock Food is that it largely increases the appetite of the animal and gives it a relish for the feed. It also acts upon the entire digestive system, perfecting the assimilation and allowing of an abundant supply of rich, pure blood always circulating freely and unobstructedly through the veins. This, in a great majority of cases, will keep an animal entirely immune from the inroads of disease, and when disease does occur it will find the body so strong and vigorous that, as a rule, it will be forced to beat a quick retreat because of the body's increased powers of resistance. Davis Stock Food ought to be fed at all times to every animal on the stock farm. It costs but little and it is impossible to measure the great good it accomplishes in preventing disease and improving the health and value of the stock. Its value in dollars and cents to the owner of the farm is indeed great.

Nature and Treatment.—The disease, as is well known to sheep raisers, is a contagious affection of the skin caused by a parasitic mite. It dates back in time about as far as recorded history, and even in the Old Testament allusions are found to the malady, the use of scabbed sheep being forbidden in sacrifices. It is commonly called the mange, or scabies of the sheep. As a result of diligent research certain investigators reached the conclusion that the malady was due directly to the mites which are found inhabiting the diseased parts of the skin. Their opinion was not at once adopted, however, but on the other hand strong opposition was brought to bear upon their theory by those who held that scab was due to a diseased condition of the blood, as well as from others who held a modified view to the effect that the mites carried poisonous or diseased material from one animal to another and in this manner communicated the disease. The errors and uncertainties which came down to us through centuries of controversy were finally and for all time dispelled by conclusive experiments upon animals during the first part of the century. It was shown that scab does not develop and cannot be produced without the parasites. It was shown that mites are always the offspring of ancestors, the same as are the larger animals, and it has in later years come to be admitted that there is no such thing known as spontaneous generation of any living thing.

Sheep Scab.

under any circumstances. The demonstration was repeatedly made that the disease always developed if mites were taken from the diseased sheep and placed upon healthy ones, and that diseases of the skin resembling scab are not contagious unless the mite is present.

Even now, questions are still being asked by persons not conversant with the investigations on the subject, as to whether the scab is the cause of the mite or the mite the cause of the scab, and also whether the disease can develop without the presence of the scab mite. The investigations just referred to answer these questions and also show that the treatment must consist in external applications for the destruction of the parasites and not internal remedies to purify the blood. Among some sheep owners the impression also has gained foothold that scab is hereditary. But this is not the case. Scab is no more hereditary than are sheep ticks or sheep lice, for the parasites which cause it live on the external surface of the body and do not reach the womb. It is possible, however, for a lamb to become infected from a scabby mother at the moment of birth or immediately afterward. Lambs are occasionally born with white spots on their skin, and this possibly has given rise to the idea that scab is hereditary.

Losses Caused by Scab.—Losses from sheep scab have been and still are very severe in most sheep raising countries. They are due to the shedding of wool, the loss of condition and the death of the sheep. Although laws were made for the control of the disease as early as the beginning of the eleventh century, general ignorance in regard to its nature and proper treatment has prevailed down to the present day. The disease exists in most of the countries of Europe, and also in Asia and Africa, and until recently in Australia. Most civilized countries now control the disease to a certain extent, and limit the losses by the enforcement of stringent sanitary regulations; but the extent of its prevalence is nevertheless surprising. It is a disease not difficult to cure and eradicate, and an accurate knowledge of its characteristics with attention to details are all that is needed to secure this result.

In the United States some sections have been overrun with sheep scab, and many persons engaged in the sheep industry have been forced to forsake it because of losses from this disease. The large flocks of the plains and the Rocky Mountain region and the feeding stations farther east have suffered severely and are constantly sending diseased animals to the great stock yards of the country. As a consequence of this marketing of affected sheep, the stock yards are continually infected, and any sheep purchased in these markets are, unless properly dipped, likely to develop the disease after they are taken to the country for feeding and breeding. In this way a constant distribution of the contagion takes place, and thousands of persons who know little or nothing of its nature or the proper methods of curing it find it introduced upon their premises.

In addition to the direct losses in wool, in flesh, and in the lives of our sheep, we have suffered immensely in our foreign trade because of the prevalence of this disease.

Cause.—Sheep scab is a strictly contagious disease, and is caused by that species of mites technically known as *Psoroptes communis*. These parasites cause scab in horses, cattle, sheep, goats, and rabbits; but for each of these species of animals there seems to be a distinct variety of the parasite. Although it is more or less difficult to distinguish between these varieties, they differ somewhat in size, and it is found that the mite of the sheep does not cause scab of the horse, ox, or rabbit, or vice versa.

The parasite of sheep scab is one of the larger mites, and is quite easily seen with the naked eye. The adult female is about 1-40 inch long and 1-60 inch broad, while the male is 1-50 inch long and 1-80 inch broad. These mites are discovered more readily on a dark than on a light background, and for this reason the crusts of the affected skin are often placed upon blank paper and kept in the sunshine for a few minutes in order to reveal the parasites crawling about. The mite resides on the part of the body most thickly covered with wool, the back, the sides, the rump and the shoulders. There are four different kinds of sheep mites, and the one here indicated is the psoropt, the one which is the most serious in its effects upon sheep, and the cause of the true body scab. Of the others the sarcoptic scab (head scab, or black muzzle), limited almost entirely to the head, the symbiotic scab (foot scab), which affects the limbs, scrotum and udder, and the extremely rare affection, the so called follicular, or demodedic scab, affecting the eyelids, are each caused by its own peculiar parasite. It is, however, with the body scab that we are mainly concerned, the three other varieties being comparatively mild and rare affections.

Symptoms.—The mite of the common or body scab pricks the skin of the animal to obtain its food, and probably inserts a poisonous saliva in the wound. The bite is followed with intense itching

irritation, formation of papules, inflammation, exudation of serum, formation of crusts, or scabs, under and near the edge of which the parasites live. As the mite multiplies it seeks the more healthy spots, spreading from the edges of the scab already formed, thus extending the disease. Sheep becomes restless; scratches and bites itself; rubs against posts, fences, etc.; irritation is especially noticeable after animal has been driven, for the itching increases in intensity when the animal is heated; wool falls off; fleece assumes the condition known as flowering; it looks tufty and matted; sheep pulls out portions with its mouth, or leaves tags on the objects against which it rubs; scabs fall and are replaced by thicker and more adherent crusts; skin gradually becomes bare, parchment like, greatly thickened, furrowed, and bleeding in the cracks. With shorn sheep, especially, a thick, dry, parchment like crust covers the greatly tumified skin. Ewes may abort or bear weak lambs.

When sheep are kept in large numbers chances for infection are naturally greater, and disease may extend to almost any part of the body. Generally, however, it affects parts covered with wool. When the sheep are fat and the wool has a large amount of yolk the progress of the disease may be slow, usually beginning on the upper part of the body, withers and back, extending slowly, but none the less surely, and in ever increasing area to the neck, sides, flanks, rump, etc. In two or three months' time the entire body may be affected.

Contagion.—Common scab is exceedingly contagious, readily spreading from one sheep to another, and may in some cases show itself within a week after a healthy sheep has been infected. The contagion may be direct, from one sheep to another, or indirect, from tags of wool, or from fences, posts, etc., against which scabby sheep have rubbed, or from the places where the sheep have been bedded down. One attack of scab does not protect sheep from a subsequent attack or a number of subsequent attacks. Transmitted to man, sheep scab may produce a slight spot on the skin, a point which is sometimes taken advantage of for the purpose of diagnosis. In case of suspected scab, one of the crusts is bound lightly on the arm. After a short time an itching sensation is felt and the mites are found on the skin. Transmitted to horses, cattle, or goats, common sheep scab fails to develop.

Chances for Recovery.—Recovery without treatment is rare, anemia, exhaustion and death usually following the wake of the disease; the result may be from 10 to 80 per cent of the entire flock. Seasons when wool is the longest are most favorable for the development of scab; overcrowding of the animals, also race, energy, temperament, age, state of health, length, fineness and abundance of wool, and hygienic conditions of the surroundings are factors in the termination of the disease. Young, weak, closely inbred animals, and those with long, coarse wool, succumb most quickly. Unhealthy localities, damp climate and poorly ventilated sheds favor the disease. Pure or mixed Merino sheep succumb quicker than certain other breeds. Mortality is highest in autumn and winter; if untreated the sheep may die in the course of two or three months. Hygienic conditions, good feed, and cool, dry atmosphere tend to check the disease. Take care that your sheep sheds are well ventilated and open to light and sunshine. With proper attention and the dipping treatment hereinafter described, a positive cure can be guaranteed.

Conditions Which May Be Mistaken for Scab.—Any parasite or condition which causes an itching, leading the sheep to scratch themselves, or any abnormal condition of the skin, may be temporarily mistaken for scab; but if the rule is held in mind that no scab is possible without the presence of its specific parasite, it can be readily determined whether scab is present or not. Itching due to other parasites, such as the common sheep tick, true tick and lice, may be distinguished from scab by finding the parasites. The dipping used for treating scab will also kill the sheep tick and lice. Inflammation of the sebaceous glands may also be mistaken for common scab. It occurs most frequently in the autumn. There is a severe itching, the skin is red and sensitive, and is covered with a strong smelling, yellowish, viscid yolk; tufts of wool may be shed. It may be cured, after shearing, with any starchy lotion. Rain Rot may be mistaken for scab. It appears as an eruption on the skin in rainy weather. There is, however, no parasite present; itching is absent, and the trouble disappears when dry weather comes.

Treatment.—First of all, proper hygienic conditions should be observed in the care of the sheep. This will not cure scab, but with proper feeding, keeping the digestive and circulatory functions of the system in a perfect state, by using Davis Stock Food regularly with the ration, it will be so strengthened that its resistance against inroad of disease in any form will be increased 50 per cent. Some external

application that will kill the mite is the only rational treatment when the disease is present. Of the various applications now resorted to—hand dressing, hand curing, spotting, pouring, smearing, and dipping—dipping is by far the most satisfactory.

Hand Applications.—For head scab, or light cases of foot scab, hand applications frequently suffice. You can make a nonpoisonous ointment by taking 4 ounces of oil of turpentine, 6 ounces of flowers of sulphur, and 1 pound of lard. Mix at a gentle heat, and rub in well with the hands or with a brush, at the same time breaking the crusts. A simple sulphur ointment may be made of one part of sulphur and four parts of lard; one-fourth part of mercurial ointment may be added. Sulphuric iodide also, as a rule, produces satisfactory results. It is prepared as follows: Mix in a nonmetallic vessel, as a porcelain mortar, 4 ounces of iodine with 1 ounce of sublimated sulphur, gently beating the mixture until it liquefies; the red brown liquid upon cooling becomes a gray black crystalline mass, insoluble in water, but soluble in glycerine and fats, with 8 to 10 parts of which it is mixed for ointments or liniments. An ointment of flowers of sulphur and carbolated vaseline would also probably give good results. Foot scab and head scab may also be treated with the dip used for common scab. Hand dressing never cures common scab, and should not be resorted to for this. The only case in which hand dressing can be advised for this trouble is when it is discovered in one or two sheep during winter when the weather is severe and dipping is impracticable. In this case isolate without delay the infected sheep from the flock, and use one of the remedies described above. Remember that pouring, spotting, etc., are only expensive and temporizing methods of dealing with scab.

Pouring.—Part the wool on the back by making a furrow with the finger from the head to the tail; furrows are also made along the shoulders and thighs to the legs, and on the sides; pour the ointment or dip in these furrows. A still better plan is to pour the warm dip from a coffee pot directly on the affected parts, rubbing it well in with the hand, a brush or a corn cob. As the treatment is not to be relied upon it should only be resorted to when dipping is impracticable.

Dipping is by far the most rational and satisfactory, as well as the cheapest method of curing scab. It consists in dipping the sheep in some liquid which will kill the parasites, and is done as follows:

1. Select a dip containing sulphur. If a prepared dip is used which does not contain sulphur it is always safer to add about 16½ pounds of sifted flowers of sulphur to every 100 gallons of water, especially if, after dipping, the sheep have to be returned to the old pastures.

2. Shear all the sheep at one time, and immediately after shearing confine them to one-half the farm for two to four weeks.

3. At the end of this time dip the entire flock of sheep (goats also, if there are any of them).

4. Ten days later dip them all a second time.

5. After the second dipping, place the flock on the portion of the farm from which they have been excluded during the previous four or five weeks.

6. Use the dip at a temperature of 100 to 110 degrees Fahrenheit.

7. Keep each sheep in the dip for two minutes by the watch—do not guess at the time—and duck its head at least once.

8. Be careful in dipping rams, as they are more likely to be overcome in the dip than are the ewes.

9. Injury may, however, result to pregnant ewes, which must for this reason be carefully handled. Some farmers arrange a stage with sides to hold the pregnant ewes, which is lowered carefully into the vat and raised after the proper time.

10. In case a patent or proprietary dip, especially an arsenical dip, is used, the directions given on the package should be carried out to the letter.

Proprietary Dips.—There are numerous proprietary dips on the market, each claiming to be superior to the other, and in selecting one you should remember that it is in the interest of the manufacturer under all circumstances to claim superiority for his article, irrespective of its real merits. Undoubtedly many of the dips advertised answer their purpose, but in using them you should use your own judgment and do not be deceived by the wording of the advertisement. **Never use a dip composed of a secret formula if you can avoid it. You should know the composition of the remedy before you apply it to your valuable herd. If the manufacturer of any one specific dip refuses to divulge its ingredients,**

these not being found on the package, pass him by. You cannot afford to experiment with cheap, worthless preparations whose whole strength lies in the alluring advertisement. Shun them. On the other hand it must be admitted that there are some excellent proprietary compounds.

Whatever dip is selected it is well for the farmer to remember that there are two ways of using it. One is to prepare and use it according to directions given; the other to attempt to economize time, labor or money by using it in weaker proportion than advised, by hurrying the sheep through the swim, or by later placing the dipped sheep under unfavorable conditions. If the former method is adopted with any of the established dips of known value the treatment ought to be followed with favorable results; if the latter methods are adopted the farmer himself must assume the responsibility of failure, no matter what remedy he uses. To use the dip properly is just as important as to use the right dip.

Choosing a Dip.—Tobacco or sulphur constitute the basis of most of the successful home made dips, while the prepared dips contain tobacco, sulphur, arsenic, carbolic acid, etc. In selecting a dip the question of expense will naturally arise among the first considerations, next in importance being the question as to whether or not scab actually exists in the flock to be dipped, or whether or not the dipping is more of a precautionary measure, or for the sake of cleansing the animal's skin. In estimating the expense one should consider not only the actual outlay for the ingredients, but the cost of fuel and labor, the injury, if any, to the sheep, and the liability of not curing the disease. It is far cheaper to use an expensive dip and cure the scab than it is to use a cheap dip and fail to cure it. Again, every farmer should ask himself if scab actually exists in his flock before he selects a dip. If scab does not actually exist and the wool is long, the dipping in this case simply being a matter of precaution, it is best not to select a dip containing lime. **The use of the lime and sulphur dips is therefore not advised simply as a precautionary dressing for healthy, long woolled sheep. On the contrary the use of any dip containing lime, as a precautionary measure, should be avoided. If facilities for preparing the dip are not good; if, for instance, fuel is very scarce in your neighborhood, so that it is impracticable to boil the mixture for at least two hours, do not select the lime and sulphur mixture.**

A tobacco and sulphur dip, as well as many of the better class of proprietary dips, can be made without the necessity of lengthy boiling, and should be given preference if facilities for boiling are not at hand. If it be necessary to place the dipped sheep on the same pastures they occupied before being dipped, it is always best to use a dip containing sulphur. If it be possible to utilize fresh pastures after dipping, the use of sulphur is not so necessary, but is always advisable. The object in using sulphur is to place in the wool a material that will not evaporate too quickly, remaining there for a longer period than the scab parasites ordinarily can live away from their hosts, thus insuring the sheep against reinfection.

Tobacco and Sulphur Dip.—Sulphur is one of the oldest known remedies for scab, dating back to the early part of the Christian era. It is one of the best scab eradicators in existence. It is contained in some of the proprietary dips, but is best known in the home made tobacco and sulphur dip and the lime and sulphur dip. These two have played the most important roles in the eradication of scab from certain English colonies, and their use, especially the use as well as the abuse of the sulphur and lime dip, is quite extensive in this country.

The home made tobacco and sulphur dip, one of the simplest and most efficient remedies for scab in sheep, is prepared as follows: Tobacco leaves, 1 pound; flowers of sulphur, 1 pound; water, 6 gallons.

These are the proportions adopted by Rutherford, an authority upon the subject, and afterward made official by the scab sanitary authorities. Its advantage lies in the fact that two of the best scab remedies, namely, tobacco (nicotine) and sulphur are combined, both of them killing the parasites, while the sulphur remains in the wool protecting it for some time against reinfection. As no caustic is used to soften the scab, heat must be relied upon to penetrate the crusts.

In preparing the dip, place 1 pound of good leaf or manufactured tobacco, to every 6 gallons of dip desired, in a covered boiler of cold or luke warm water and allow it to stand for about twenty-four hours. On the evening before dipping bring the water to near the boiling point (212 degrees Fahrenheit) for an instant, then remove the fire and allow the infusion to stand over night.

Next in the process, thoroughly mix, with the hand, the sulphur (1 pound to every 6 gallons of dip desired) in a bucket of water to the consistency of gruel. When ready to dip, thoroughly strain the

tobacco infusion from the leaves by pressure, mix the liquid with the sulphur gruel, add enough water to make the required amount of dip and thoroughly stir the entire mixture. Then it is ready for use.

Lime and Sulphur Dip.—There are a number of lime and sulphur dips in use, prepared from different formulas; of these we shall here only give two which are used by the United States Bureau of Animal Industry, and Fort Collins, and which are among the best proportioned lime and sulphur dips for use in America:

1. U. S. Bureau of Animal Industry:

Flowers of sulphur	24 pounds.
Unslaked lime	8 pounds.
Water	100 gallons.

2. Fort Collins:

Flowers of sulphur	33 pounds.
Unslaked lime	11 pounds.
Water	100 gallons.

In cases of fresh scab, Formula No. 1 will act as efficacious as the dips with a greater amount of lime, but in cases of very hard scab, a stronger dip, as the Fort Collins dip, should be preferred. You will do well to hold yourself to the dips here mentioned, and not experiment with any of the numerous other dips in use, the formula of some of which is injurious alike to the wool and health of the sheep. Do not pay any attention to the assertions of the agents of patent or proprietary dips, to the effect that lime and sulphur dips do not cure scab. These objections are naturally made by them in order to boom their employers' articles. Experience in Australia, South Africa, as well as in this country, has proved beyond a doubt that a lime and sulphur dip, properly prepared and rightly used, is one of the best scab eradicators known. Cases of its failure have been due to careless or improper methods of its preparation and use. That the great objection raised against the lime and sulphur dip, namely, that it injures the wool, is largely without foundation, is strongly and steadfastly asserted by the Agricultural Department of Cape Colony. It is, however, believed that a certain amount of justice is attached to this objection to the lime and sulphur dip as generally prepared and used; unless, therefore, it can be used in a way which will not injure the wool, we should advise against its use in certain cases; in other cases the good it does far outweighs the injury done. Let us briefly look into whatever damage it possibly may be guilty of doing.

The usual time for dipping sheep is shortly after the shearing, when the wool is very short; whatever damage is done at this time can be but very slight, and the small amount of lime left in the wool will surely do but little harm.

In full fleece, lime and sulphur may cause more injury. In Australia the deterioration was estimated by wool buyers at 17 per cent, in spite of the assertion of the Department of Agriculture in Cape Colony that if properly prepared, and if only clear liquid be used, the sediment being thrown away, the lime and sulphur formula, as officially proportioned by the department (flowers of sulphur, 20 $\frac{5}{8}$ pounds; unslaked lime, 16 $\frac{2}{3}$ pounds; water, 100 gallons), will not in any way injure the long wool. Other conditions, such as variations of feeding, pasturing on alkaline lands, ill health, from any cause, etc., may have something to do with this, causing brittleness of the wool, which is laid at the door of the dip. If you use the lime and sulphur dip take care to give the solution ample time to settle, and only use the clear liquid, discarding the sediment. The sediment if left in may cause serious injury. Do not use the lime and sulphur dip at all if you are unable to properly prepare it in accordance with one of the formulas we have given (the Cape Colony formula is also good). Be careful always to allow the preparation to boil and settle properly. If your sheep do not suffer from scab proper, or from one of the milder varieties of the disease, tobacco, or sulphur and tobacco, is safer to use and will prove equally as satisfactory. For ordinary cases of scab use the Bureau of Animal Industry or Fort Collins formula, which contains a comparatively small amount of lime. In answer to other objections raised against the lime and sulphur dip, namely, that it occasions a shrinkage in the sheep greater than is the case after the use of other dips, the Bureau of Animal Industry states that such has not been the case in its experiments, and suggests at the same time that the claim is raised chiefly by patent dip manufacturers.

Taking everything into consideration, where it is a choice between sacrificing the weight of sheep, and to some extent the color of the wool, by using tobacco and sulphur, and sacrificing the staple of the wool, by using lime and sulphur, the farmer should not hesitate an instant in selecting tobacco in preference to lime.

Preparation of the Lime and Sulphur Dip.—The following is the method of preparation adopted by the Bureau of Animal Industry:

A. Take 8 to 11 pounds of unslaked lime, place it in a mortar box or a kettle or pail, and add enough water to slaken the lime and form a lime paste or lime putty.

B. Sift into this lime paste three times as many pounds of flowers of sulphur as used of lime, and stir the mixture well. Be sure to weigh both the sulphur and lime. Do not trust to measuring them in a bucket or to guessing at their weight.

C. Place the sulphur lime paste in a kettle or boiler with about 25 to 30 gallons of boiling water, and boil the mixture for at least two hours, stirring the liquid and sediment. The boiling should be continued until the sulphur disappears, or almost disappears, from the surface; the solution is then of a chocolate or liver color. The longer the solution boils the more the sulphur is dissolved, and the less caustic the ooze becomes. If possible, continue boiling two or three hours, never less than forty minutes.

D. Pour the mixture and sediment into a tub or barrel placed near the dipping vat and provided with a bung hole about 4 inches from the bottom and allow ample time (two to three hours, or more, if necessary) to settle. The use of some sort of settling tank provided with a bung hole is an absolute necessity, unless the boiler is so arranged that it may be used for both boiling and settling. An ordinary kerosene oil barrel will do very well for a small settling tank. To insert a spigot about 4 inches from the bottom is an easy matter. Draining out the liquid in preference to dipping it out has the great advantage that less commotion occurs in the liquid, which therefore remains freer from sediment.

E. When fully settled, draw off the clear liquid into the dipping vat and add enough warm water to make 100 gallons. The sediment in the barrel may then be mixed with water and used as a disinfectant, **but under no circumstances should it be used for dipping purposes.** A still better precaution against allowing the sediment to enter the vat is to strain the liquid through ordinary bagging as it is drawn from the barrel.

Tobacco Dip.—For every 100 gallons of dip desired take 21 pounds of good prepared tobacco leaves; soak the leaves in cold or lukewarm water for twenty-four hours in a covered pot or kettle; then bring the water to near the boiling point for a moment, and, if in the morning, allow the infusion to draw for an hour; if in the evening, allow it to draw over night; the liquid is next strained (pressure being used to extract as much nicotine as possible from the wet leaves) and diluted to 100 gallons per 21 pounds of tobacco. This dip should be used as fresh as possible, as it contains a large amount of organic material which will soon decompose. The proportions here given, 21 pounds of prepared tobacco leaves to 100 gallons of water, have given very satisfactory results, especially in Cape Colony. The advantages of the tobacco dip are that it is comparatively cheap, since the farmer can grow his own tobacco; that it is effectual and at the same time not injurious to the wool. Its disadvantages are that it sometimes sickens the sheep; that it also occasionally sickens the persons who use it, especially if they are not addicted to the use of the weed; also, it spoils very rapidly; it causes a greater setback than lime and sulphur, but less of a setback than carbolic dips.

Potassium sulphide dips, and arsenical dips, are also advertised in the market; they are mostly proprietary preparations, and are not of sufficient importance to be included here, except in so far as that we warn our readers about being extremely careful in their use, as a large percentage of them are dangerous, although they should not all be condemned, arsenic properly compounded having excellent scab curing qualities in many instances. In winding up our treatise on the various compounds and their respective merits and demerits, we have here but room to mention one more, namely:

The Carbolic Dip.—This may either be made at home or purchased as a proprietary article, and kills the mite very quickly. Unfortunately, however, the wash soon leaves the sheep, which is therefore not protected against reinfection in the pastures. Therefore, if you select a carbolic dip, you will do well to add flowers of sulphur (1 pound to every 6 gallons) to protect against reinfection. The advantages of the carbolic dip are that it acts more rapidly than the tobacco or sulphur dips, and if bought in prepared

form it is very easily mixed in the bath. It also seems to be more destructive to the eggs of the parasites. Disadvantages are that in many of the proprietary dips, the farmer is left in the dark regarding the strength of material he is using; second, the sheep receive a greater shock than they do with either lime and sulphur or tobacco. The Bureau of Animal Industry is now conducting tests with this dip, but seems on the whole not very enthusiastic in its reports, although it admits that the dip has its merits, and should not be wholly condemned. But be sure when you buy it to ascertain the exact ingredients of the article, as put up by its proprietors. If they refuse to give this, better leave it alone, and resort to the other dips. When you do use it, follow the directions which go with it implicitly. Then carefully watch the results.

Setback to the Sheep from Dipping.—Immediately after the dipping there may be slight gain in weight, but usually a loss varying from $\frac{1}{2}$ to $3\frac{1}{2}$ pounds is recorded. A longer time, however, is necessary to estimate the ultimate loss or gain. The Bureau of Animal Industry conducted experiments to ascertain this a little while ago, and found that at the end of about two months, after three dippings, all of the sheep showed gain, with the exception of one of the sheep from the carbolic dipping, which lost slightly. The lowest gain among the sheep treated with tobacco dip was $3\frac{1}{2}$ pounds, the highest, $11\frac{1}{2}$ pounds; among the sheep treated with sulphur and lime the lowest gain was 7 pounds, the highest, $8\frac{1}{2}$ pounds; among the sheep treated with the carbolic dip the lowest gain was $1\frac{1}{2}$ pounds, the highest, $3\frac{1}{2}$ pounds, while one animal lost $\frac{1}{2}$ pound. After a fourth dipping the following gains and losses over their original weight were recorded: Sheep treated with tobacco, 9 to 15 pounds gain; sheep treated with lime and sulphur, $11\frac{1}{2}$ to 14 pounds gain; sheep treated with carbolic dip, 1 to $6\frac{1}{2}$ pounds gain, with one sheep losing $13\frac{1}{2}$ pounds.

In repeating the experiment, the lime and sulphur were used on sheep previously dipped in carbolic or tobacco dips, and vice versa. After ten days the sheep treated with lime and sulphur had gained from 2 to 3



Figure 5. Caldron that may be Used for Boiling Dip.

pounds; the sheep treated with tobacco had remained stationary or had lost from 1 to $1\frac{1}{2}$ pounds; the sheep treated with carbolic dip had gained as high as 1 pound, or remained stationary, or lost as much as $2\frac{1}{2}$ pounds.



Figure 6. Caldron with Stove.

Remembering that sheep may apparently gain or lose about 3 pounds per day when not dipped, it is seen from the experiments by the United States Bureau of Animal Industry that the oft repeated claim that lime and sulphur dips give a greater setback than other dips is erroneous. In the experiments by the Bureau, which are amply corroborated by other authorities both in the East and West, the sheep treated with lime and sulphur averaged the greatest gain, the sheep treated with tobacco the second highest gain, the carbolic sheep the lowest gain. We may properly conclude these remarks by saying that a distinct gain instead of a setback may be claimed for the dip in all instances.

Dipping Plants.—Among the numerous dipping plants in use, varying in size and style according to the conditions which they are to meet, we shall here mention a few of the most convenient and practical.

The farmer who has but a small flock can use a small portable vat for dipping, turning a part of his barn or some shed into a catching pen; by holding the sheep for a moment at the top of the incline, as the animals emerge from the vat, and allowing them to drain, he can do away with the necessity of a draining yard. When a large flock is to be dipped at stated periods it will be economy to build a

more permanent plant. Such a plant should consist of (1) collecting and forcing yards, provided with a (2) drive, and (3) chute, or slide into the (4) dipping vat, from which an (5) incline with cross cleats leads to the (6) draining yards.

Heating tanks and boilers also must be provided. For a small vat any portable caldron (Figures 5 and 6) with a capacity of 30 to 100 gallons will answer, and the proper temperature may be maintained by pouring fresh, hot ooze into the vat as the supply is exhausted by the dipping. In the large permanent plants the temperature can best be regulated by means of a steam pipe or hot water coil close to the floor of the tub.

Thermometers are an absolute necessity. The floating dairy thermometer (Figure 7) is the best. Always keep several thermometers at hand to replace broken instruments. Drop the thermometer into the vat and allow it to float for a short time, then quickly remove it, and determine temperature. Make plain point marks at the side of the 100 and 110 degree points.

Building Material.—You may build the yards and vats of wood, concrete, cemented stone, or brick, as is most convenient to you.

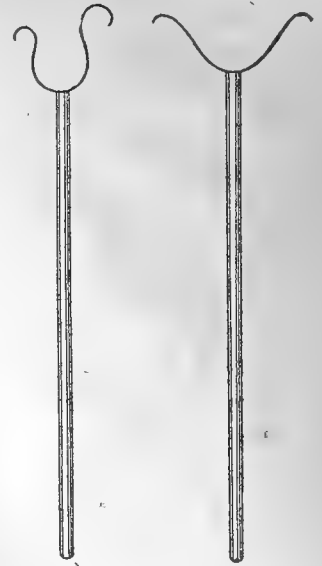
Dimensions.—The dimensions of the various parts, given in the following descriptions, may be varied according to the breed and the number of sheep to be dipped. You may save dipping liquid by making the tub much narrower at the bottom than at the top. On top, simple, oblong dipping tanks vary from 1 foot 9 inches to 3 feet in breadth, 2 feet or 2 feet 6 inches forming a convenient medium. Floors vary from 6 inches to 3 feet in width, 9 inches forming a good working medium. Depth varies from 3 feet to 5 feet 6 inches, 4 feet to 5 feet forming a convenient medium. If calves are to be dipped in the same vat it will be best to make the tub 5 feet or 5 feet 6 inches deep.

In sinking the tub in the ground leave its top 9 inches above the ground line. Also sink one end (the one where the sheep are thrown in) slightly lower than the other. This makes it easier to empty and clean the vat.

Crutches or Forks.—In using large vats crutches or dipping forks are necessary, and even with a small vat they are useful. Crutches should be 5 or



Figure 7.
Floating Dairy
Thermometer.



Figures 8 and 9.
Dipping Crutches or Forks.

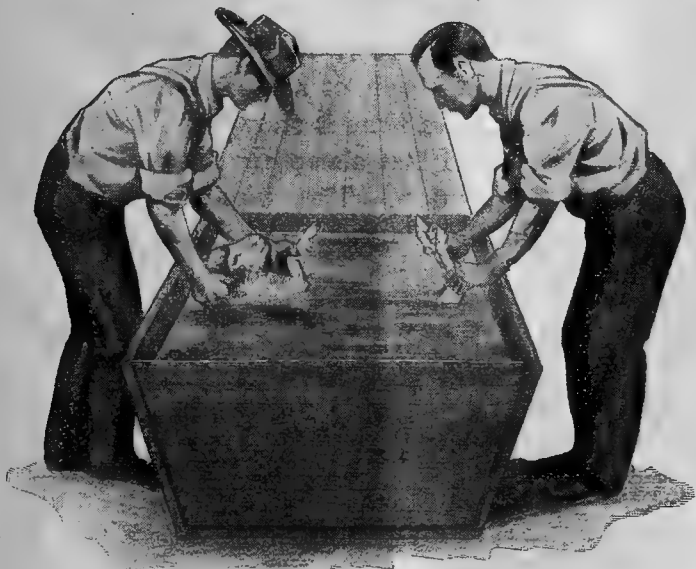


Figure 10. Dipping by Hand.

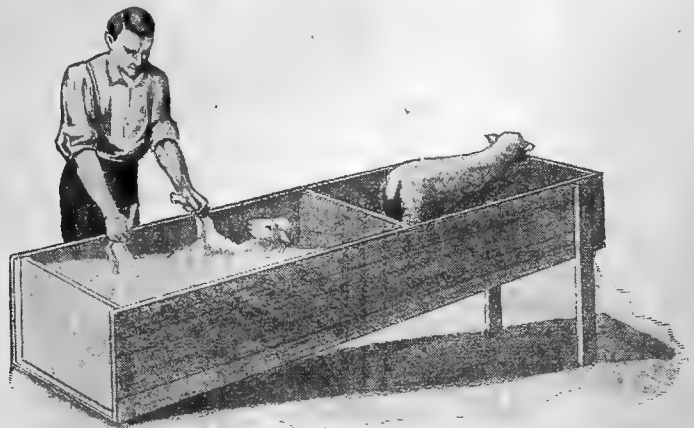


Figure 11. Trough for Dipping Lambs.

6 feet long. The handle should be strong (rake handles are a little too light). One end is provided with an iron ferrule, into which the bent iron is inserted. The iron should be $\frac{1}{2}$ inch round or $\frac{3}{4}$ inch half round. The form of the crutches is shown in Figures 8 and 9.

Gauges.—The capacity of tubs should be plainly marked on the side every 3 to 6 inches, in order to correctly measure the amount of liquid.

Small Portable Vats.—If you have no regular dipping vat, you can utilize a good sized tub, as shown in Figure 10. Dipping in this manner is slow and tedious,

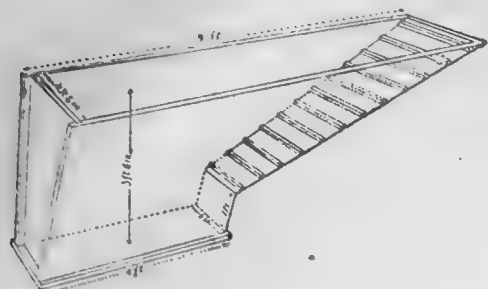


Figure 12. Portable Vat for Small Flocks.

but may be resorted to in case of necessity, as, for instance, when a few sheep are brought from another flock which is not known to be absolutely free from scab. If care is taken to dip thoroughly the dipping may be as effective as it could be done in a large vat. It is, however,

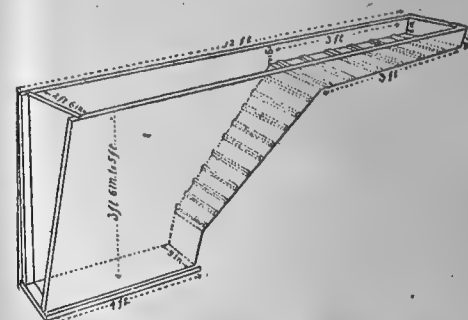


Figure 13. Portable Vat with Drip Board.

better to have regular vats for the purpose. Lambs may, in case of necessity, be dipped in troughs, as shown in Figure 11.

A small portable vat, suitable for use in dipping small flocks, is shown in Figure 12. Store it away when you do not use it. This you may draw from place to place as desired. The dimensions we give may be varied, according to your own needs, by making the vat longer, broader or deeper. A convenient size will be 9 feet long by $2\frac{1}{2}$ feet broad at the top, 9 inches broad at the bottom, and $3\frac{1}{2}$ to 5 feet deep; the floor measure, 9 inches broad by 4 feet long; from 1 foot above one end of the floor a slant with cross cleats rises to the top and end of the vat. Drop the sheep in by hand, one by one, at the deep end, hold them in the dip for two minutes and then allow them to leave the vat at the slanting end. Hold them a moment on the slant to allow them to drain off, saving the dip. You can place a gate at the deeper end of the slant if you wish, thus saving the labor of holding the sheep. This gate should swing to the exit of the vat. You can make such a tank of $1\frac{1}{2}$ -inch pine boards, with tongue and groove. It should be well pitched and painted.

You can easily modify this plan of vat, so as to have a small dripping pen attached, as shown in Figures 13 and 14. In this modified plan an inclined platform is added to the vat shown in Figure 12 and a removable skeleton box is made to fit over it. While one sheep is being dipped another sheep is allowed to ascend the incline into the small dripping pen. When the sheep is sufficiently drained the gate is opened, it leaves the pen, the gate is closed, the sheep in the vat enters the pen, and another sheep is placed in the vat. A small portable vat, used in some places, is shown in Figures 15 and 16.

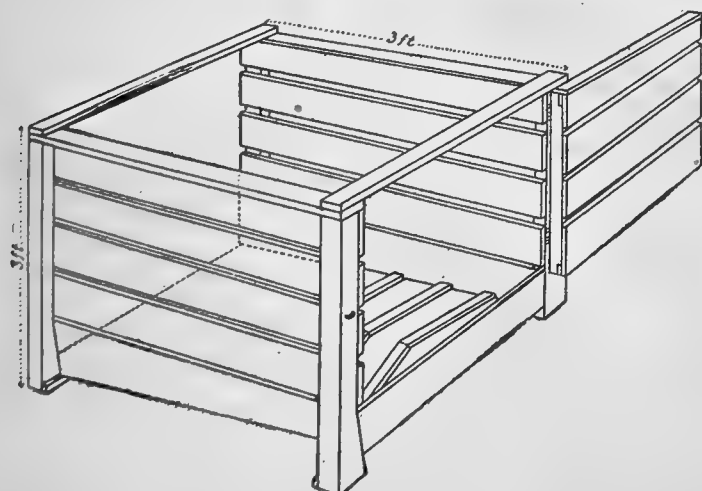


Figure 14. Detachable Skeleton Box with Gate to Fit Over Drip Platform Shown in Figure 13.

Dipping in a vat of this kind may be thorough, but is tedious. Another style of small vat suitable for holding three sheep at a time is shown in Figure 17. It is estimated that 1,500 sheep may be dipped in this tub in a single day. The dimensions of the plant are given in the diagram, and need no further explanation.



Figure 15. A Patented Portable Vat.

Permanent Plants for Larger Flocks.—Where large numbers of sheep are to be dipped, it is necessary to build receiving pens close to the dipping vat. The number and size of the pens vary with the number

of sheep to be handled. The yards may be either square or oblong, as shown in Figures 17 and 18, or they may be circular, as shown in Figure 19.

The square or oblong yards are the more simple in construction and need no further description than the diagrams furnish. The circular yard, however, needs a few words of explanation.

In using the circular yard (Figure 19) two natural habits of the sheep are turned into practical account so as to lessen the work of driving, namely, the habit sheep have of ringing when disturbed in a yard, and the tendency they show to escape at the point where they enter an enclosure.



Figure 16. Patented Portable Vat Unfolded and in Use.

When yards 3, 4, 5 and 6 are filled the other gates are closed, so that the sheep cannot turn to yards 1 and 2. If the animals hesitate to enter yards 3, 4, 5 and 6, another natural tendency of the sheep may here be turned into account.

A man jumps over the fence and runs through the flock in the opposite direction (6, 5, 4, 3) to that in which the animals are wanted to move. This will generally result in starting the sheep in the desired direction.

From the exit of yard 6 (B C) there should be built a narrow run extending to the dipping vat. The run should be about 20 feet long by 2½ feet wide, and should be provided with sides high enough,

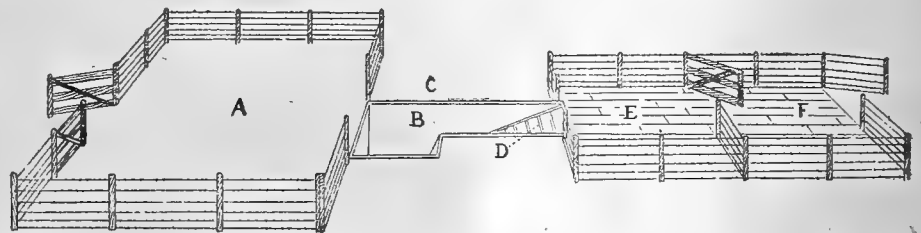


Figure 17. Small Dipping Plant: (A) Collecting Yard, (B) Vat, (C) Place for Man with Fork, (D) Incline to Draining Pens E and F.

especially near the vat, to prevent the sheep from jumping over and thus escaping. These sides should be continued a short distance along both sides of the vat. The last 5 feet of this run should slant downward toward the vat at an incline of 25 to 30 degrees, and should be smooth. By pouring upon it some of the dip it may be made slippery so that the sheep will slide into the vat. If there is no natural incline toward the vat, an inclinè may easily be made by raising the floor of the run to a point 5 feet from the vat. The sheep will then pass up the incline, X, to the highest point, Y, then down the incline chute, Z.

Much time will be saved in dipping if the yards and run are arranged in such a way that the sheep in the race cannot see the dipping vat. This can be accomplished by either of two simple methods: First, the run, instead of being straight,

may be built with a sudden angle at the point, Y (see Figure 19); the vat will then not be visible to the sheep ascending the incline, X; or, second, if a straight run is built, as shown in Figure 19, a loose curtain of bagging may be hung at the point where the run joins with the vat. This curtain will fall back into place as the sheep drops into the vat.

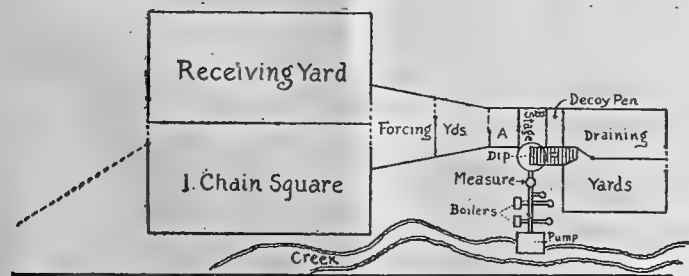


Figure 18. Another Dipping Plant.

A modification of the circular pen is shown in Figure 20, taken from Gibson's (1893) History and Present State of the Sheep Breeding Industry in the Argentine Republic.

Chutes or Slides.—The simplest kind of chute is made by using an incline at the end of the run, as shown in Figure 19. A second kind of chute in use is the endless chain or treadmill chute, shown in Figure 21. Its construction can be seen from the diagram and need not be described in detail.

This chute may be improved by building it on a slant toward the vat in which case a bolt or other arrangement must be attached to stop the chute when desired; the weight of the sheep on the movable chute will help to carry the animals toward the vat.

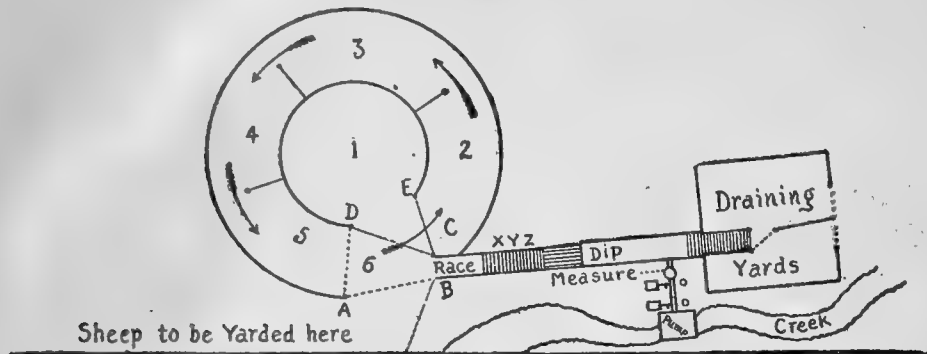


Figure 19. An Australian Dipping Plant.

A third chute in use is a pivoted platform, shown in Figure 22. The sheep walk out on the platform until they overbalance its free end, and then, when a sliding bolt is removed, fall into the tank. The structure of the chute may be seen from the figure. Accidents are more likely to result from using this chute than from using the slant or the chain chute. For dipping pregnant ewes some persons build a movable platform which can be lowered into the vat and raised at will.

The dipping vat may be made on several different plans: The single oblong straight vat; the double or triple, with turns at the ends; the square; or the circular. In case of single oblong vats,

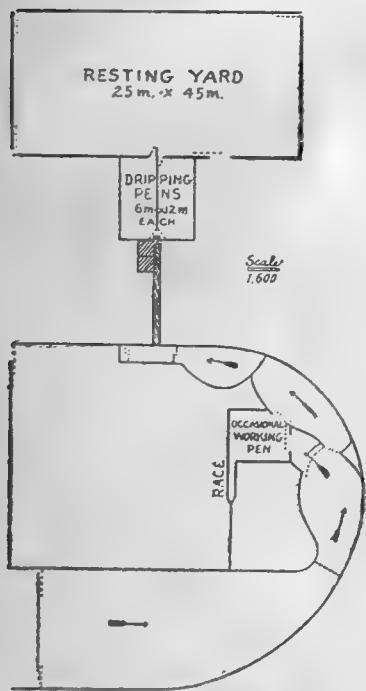


Figure 20. Argentine Semicircular Receiving and Forcing Yards, with a straight vat, draining pens, etc. The dimensions are given in the metric system; 1 m. (meter) equals 39.36 inches.

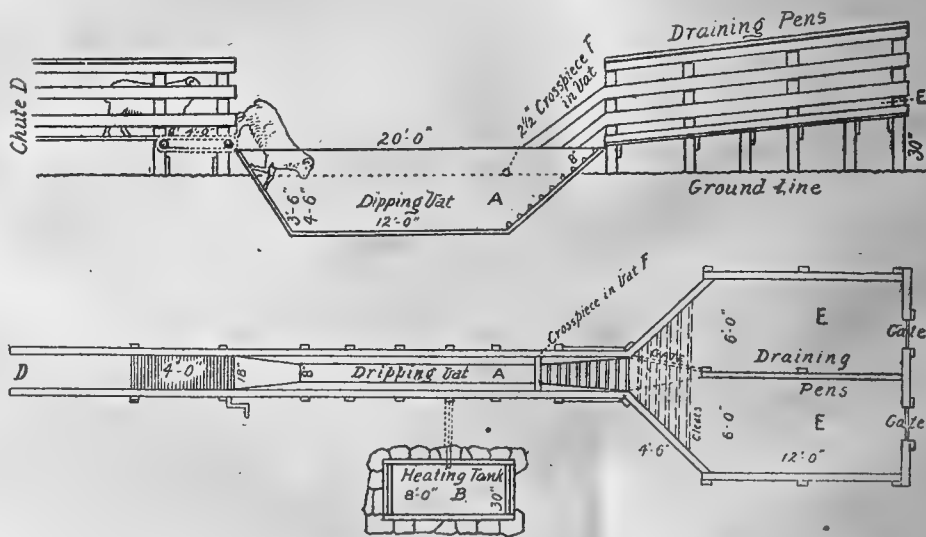


Figure 21: Dipping Plant Provided with an Endless Chain or Treadmill Chute.

time will be saved in dipping if a long vat is used, so that the animals may swim directly through without stopping, and then leave the tank. Very naturally the longer the vat the more building material and ooze will be required. Vats in use vary from 10 to 120 feet long.

Single oblong dipping vats are shown in Figures 18, 19, 20, 21 and 23. These tanks should be made about 2½ feet broad at the top, 9 inches broad at the bottom, and 4 to 5 feet deep; the length may be 20 to 120 feet, if desired. One end (the entrance) should be straight, as shown in Figures 24 and 26, or with a steep slant, as shown in Figures 21, 23 and 25, while the last 5 to 14 feet at the other end (exit) should have a gradual slant with cross cleats.

A square vat is shown in Figure 22. This vat should be 5 feet deep and large enough to hold 10 or 12 sheep at a time. The square vat does not present any particular advantages over narrow oblong vats, except that it gives the sheep an opportunity to swim around. This kind of a vat is not in very general use among large herders.

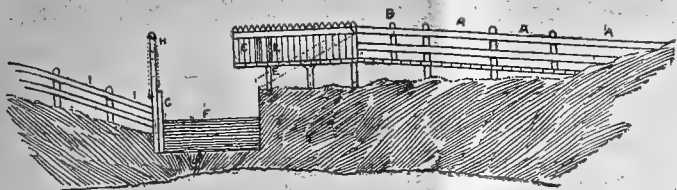


Figure 22.

Dipping Plant Illustrating; A, collecting and forcing yards; B, straight drive; C, decoy pen in which several sheep are kept; D, dipping pen with pivoted floor, E, secured by a bolt; by withdrawing the bolt the sheep are precipitated into the square vat F; G, sliding gate through which the sheep pass from the vat to the draining pens, J and K; L, channel for drip, conducting the ooze back to the vat. The lower diagram gives a surface view of the upper figure.

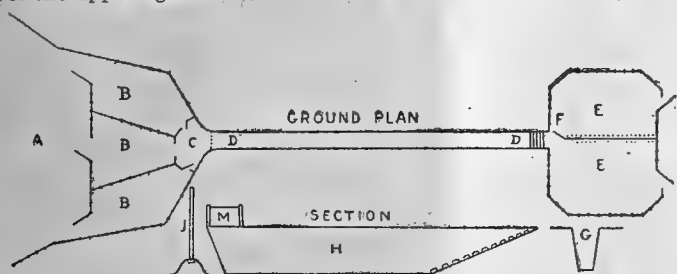


Figure 23.

A, Collecting Yard for the Sheep which are to be Dipped; B, B, B, small pens leading to C, an inner pen with an inclined chute, or in which a man may stand to pass the sheep one at a time into the vat; D, D, the vat, which should measure from 20 to 120 feet long, 21 to 30 inches broad at the top, 6 to 9 inches wide at the bottom; M, board two feet high on each side of the entrance of the vat to catch the splash and to prevent the sheep from escaping; E, E, draining, or dripping pens; F, swinging gate; G, cross section of the vat; J, crutch for keeping the backs of the sheep under the surface, and for catching or holding sheep in the dip.

In the triple vat (Figure 28) the sheep come through the run, or drive, and slide into the first vat at A; swimming in the direction of the arrows they round the turns, B and C, ascend the incline, D, and enter the draining pens. The theory upon which this triple vat is based is that upon rounding the point, B, the sheep bend toward the left, thus crumbling the scabs on the left side and opening the wool on the right; upon rounding the point, C, they bend toward the right, crumbling the scabs on that side and opening the wool on the left. That is evidently a more theoretical than practical consideration.

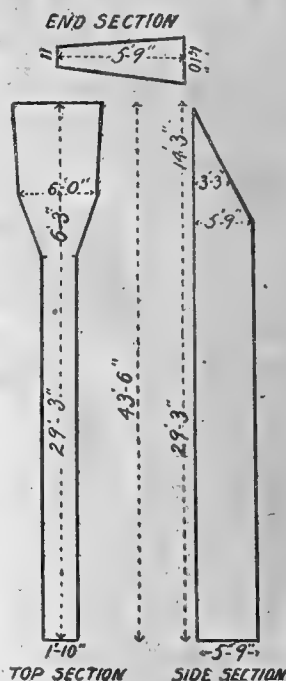


Figure 24.
A Straight Vat Known as the Australian Sheep Dipping Tank.

Each run should be about 15 to 30 feet long and 2½ feet broad; the tank should be 4½ to 5 feet deep and 4 to 7½ feet wide at the bottom.

At the point, A, where the sheep fall into the vat, it is best to have the floor of the first run 2½ feet wide for a distance of 6 feet in order to prevent accidents, but beyond that distance the floor may be narrowed to save the dipping fluid. If the partitions, E and F, are not made solid the ooze will circulate more easily and thus remain at a more even temperature; the boards should be close enough together, however, to prevent the sheep from catching their feet in the cracks. A gate should be arranged at D; so that the animals may be delayed in the ooze if desired.

Some parties prefer a circular vat (Figure 29). The advantages set forth in favor of this are, first, a fewer number of men are required to attend to the animals in the vat; second, where it is desired to give any particular sheep an extra long swim, this may be done by quickly closing the gate, D, at the exit, thus compelling the animal to swim around again, without delaying the other sheep; third, by building a circular vat with a circumference of 30 feet the animals may be made to swim around two, three or four times, thus gaining the advantage of a tank 60, 90, or 120 feet long, yet with a much smaller amount of dipping material.

The vat should be 2½ feet broad at the top, 9 inches broad at the bottom and 5 feet deep. To determine the circumference multiply the diameter by 3.1416. Despite the advantages of the circular tank in saving material and obtaining the advantages of a long swim, there are two rather serious objections to it: First, in the vat shown in Figure 29, it is necessary to throw the animal in by hand, since

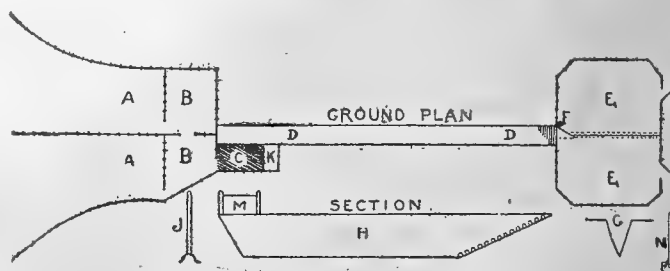


Figure 25.

A Somewhat Similar Plant: A, collecting pens; B, B, smaller pens; C, small pen at the side of the vat; K, decoy pen in which several sheep are placed to induce the sheep in pen B to enter pen C; D, D, a vat 50 to 60 feet long, 5 feet deep, 21 inches broad until 3 feet from the top, then narrowing to 6 or 8 inches at the bottom, as shown in the cross section, G; M, a board 2 feet high to catch the splash; the last 18 feet of the vat slants gradually, with cross cleats, to the draining pens, as seen in H; E, E, draining pens, worked alternately with the swinging gate, F; each pen measures 24 by 15 feet and should slant toward the vat; J, crutch 5 or 6 feet long; N, mixer for stirring the liquid.

a chute directed into the circle would lead to accident; second, the circular vat is much more difficult of construction than the straight vat. These objections, however, may be overcome in several ways, still preserving all the advantages. If a circular vat is preferred and a chute is desired, the object may

be obtained by building a short, straight vat on a tangent to the circle, as shown in Figure 30. In this case two swinging or sliding gates, A and B, will be required.

All of the advantages of the circular vat may be combined with the easy construction of the straight vat by building a straight tub with a double channel, as shown in Figures 31 and 32, the second swim being prolonged in an incline to the draining pens. Such a vat may be constructed as follows:

Build an oblong tub 15 feet long, 5 feet deep, 5 feet wide at the top, and 3 to 5 feet wide at the bottom. Running lengthwise through the center build an upright, partially open, partition 10 feet long

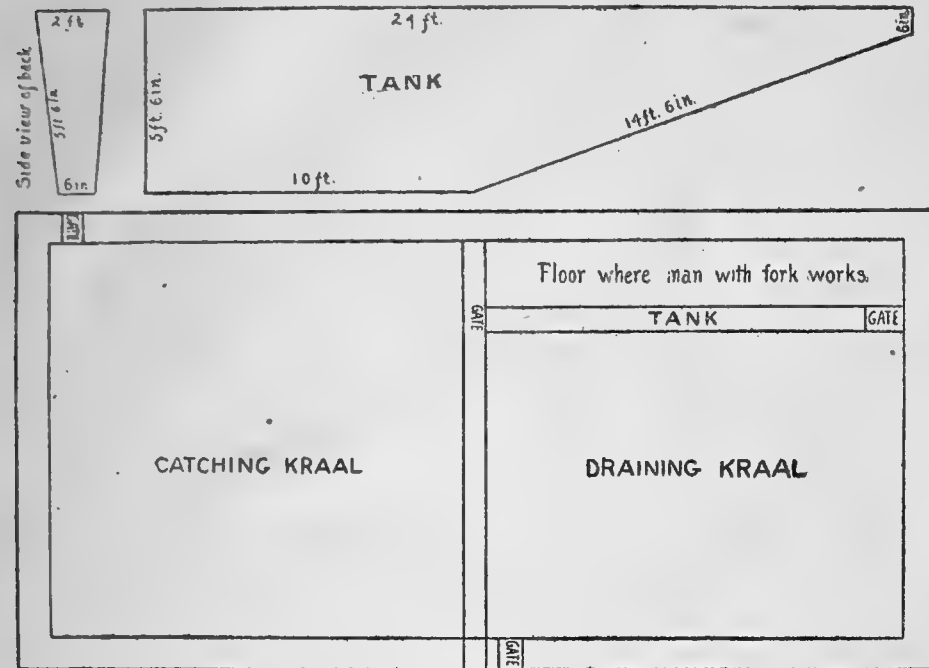


Figure 26. A Dipping Plant.

and 4½ feet deep (measured from the top of the tub), leaving an open space of 2½ feet at each end and 6 inches at the bottom; this partition is supported by three uprights running to the floor of the tub at any point except near the entrance of the swim. A gate is hung at one end between the slide (entrance) and the incline (exit), and should extend above the tub in order to prevent the sheep from jumping over the middle partition into the second swim; it should extend down to within about 6 or 12 inches of the floor of the tub. When this gate is closed against the middle partition the sheep will leave the vat by the incline to the draining pens; when it is closed against the incline, the sheep can be forced to swim around the tub two or three times, as desired. Or in place of a swinging gate, two sliding gates may be arranged to run up and down in grooves, balancing each other or each balanced separately by weights. One of these gates is placed between the end of the vat and the end of the middle portion, the other is placed at the entrance of the incline to the draining pens.

By constructing the double vat and sending the sheep around three times there would result, first, a saving in the original cost of the tank when compared with a 90-foot straight swim; second, a saving in space; third, less than half as much dip would have to be kept warm at a time; fourth, less than half as much dip would have to be made up at a time; fifth, the residue after dipping would be reduced and thus the loss decreased. It would, however, take a longer time to dip a large flock of sheep in such a vat than in a straight vat, 90 feet long.

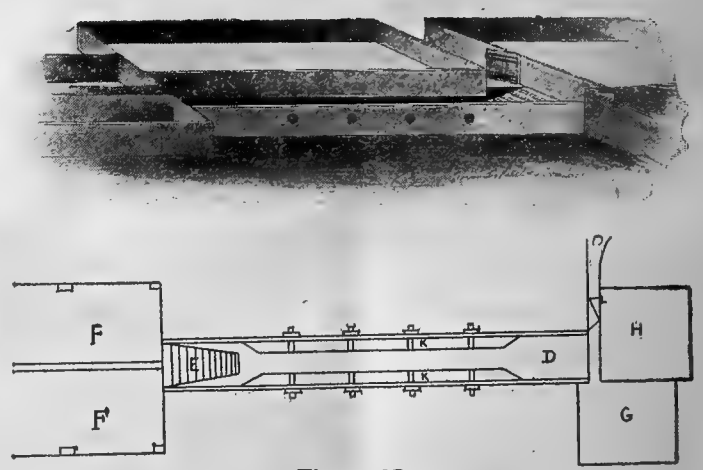


Figure 27.

A Dipping Plant in Use in Millard County, Utah. Tank, D; K, K, two pieces, 2 by 6 inches and 12 feet long, bolted lengthwise of the tank, leaving a 12-inch space in the middle of the dip through which the sheep must put their heads, preventing those in rear from riding those in front, at the same time keeping their backs under the dip.

Incline to Dripping Pens.—At the end of the vat an incline with cross cleats is built so that the sheep may leave the dip of their own accord and enter the dripping pens. A board fence 2 feet high above the top of the vat should run a few feet each side of this incline to prevent the sheep from escaping. These inclines are shown in Figures 21, 23, 25 and 26; the rise for fat, heavy wool sheep must not be too steep, otherwise the exertion will be too great. In Figure 24 the incline is 5 feet 9 inches in a surface distance of 14 feet 3 inches. At the Chicago Stock Yards the incline is 9 feet.

Much labor will be saved if a hinged, or, still better, a sliding gate is placed at the deepest portion of the incline. The sheep may thus be held in the dip as long as desired; when the time is up the gate is opened and the sheep enter the draining pens.

The Dripping Pens.—There should be two dripping pens side by side (Figures 17, 18, 21, 23 and 33) with a swinging gate at the entrance; one is filled, the gate is then closed, opening the other pen; when the second pen is filled the first pen is emptied; or the pens may be in direct line with the vat (Figures 17 and 22).

These pens should have a slight incline toward the tub so that the dripping ooze will run back to the tub. A good plan is to build the incline from the sides toward the center fence; under the fence build a partially covered gutter inclining to the tub; the cover of the gutter should be removable to allow cleaning; at the end of the gutter nearest the tub place a grating to catch the wool and droppings, thus preventing these materials from being washed into the dip.

You should provide shelter for the vat, boilers and dripping pens, and it will be well to extend the cover over the drive and the forcing pens.

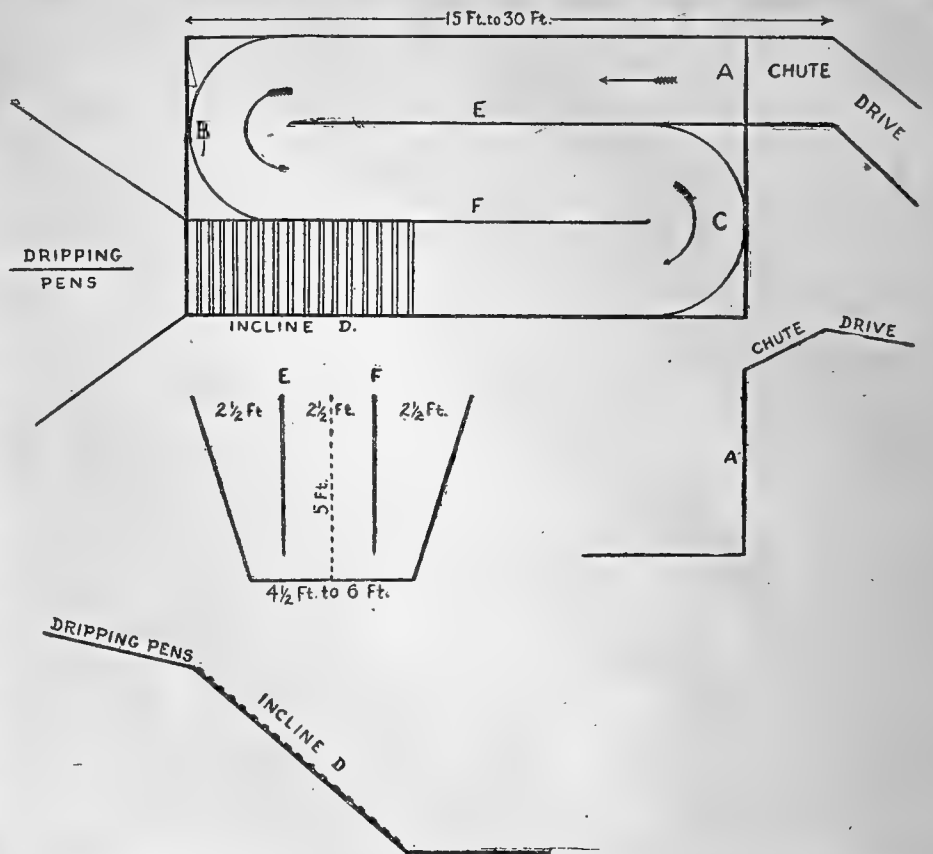


Figure 28.
A Triple Vat. The various diagrams give surface view, cross section, vertical section of entrance to the vat, and vertical section of the incline and dripping pens.

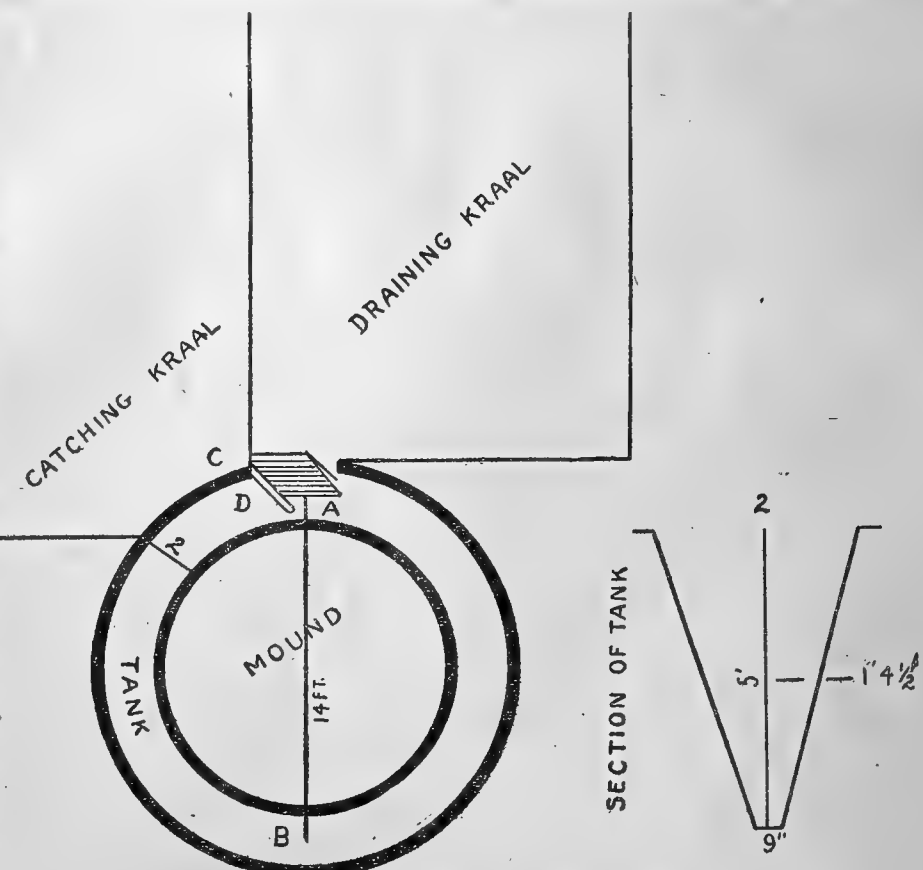


Figure 29. A Circular Dipping Tank.

Arrangements for Cleaning.—Cleaning the plant may be made easier if the following suggestions are observed: It will be well to have one end of the vat slightly lower than the other, so that the ooze

will run toward that point when the tub is being emptied. If the entire floor of the collecting pens is made of brick, cement or boards, and inclines slightly toward one or two points, the yards may be more easily cleansed by means of a hose and stream of water. If this plan is adopted there should be an upright baseboard or a solid wall of concrete or brick a few inches in height running around the edge of the entire pen. If there is direct sewer connection for the vat, a trap or manhole should be made to catch the droppings and the tags of wool, otherwise the sewer pipe will become obstructed.

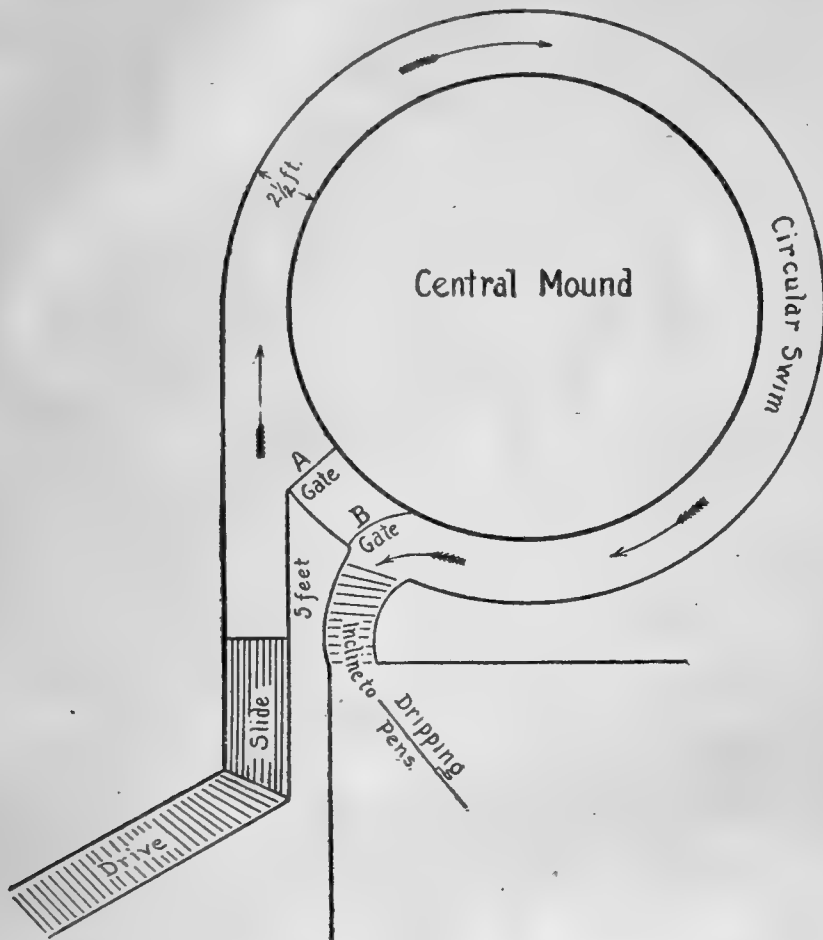


Figure 30. A Circular Dipping Tank and Drive and Slide.

may be used for heating water. Clear water is run into the vat and the steam turned on full force until the proper temperature is obtained. If a carbolic or prepared tobacco dip is used, the material may then be mixed in the vat if desired. Even in this case, however, it is best to provide a separate boiling tank for heating and preparing fresh ooze to replace the dip as it is used up. These boiling tubs may be made of wood or iron, as is most convenient for you. If steam is to be had, the square or round boiling tub may be used, an open steam pipe being run into it to heat the water. If steam cannot be used, either in the vat or in the boiling tanks, iron tanks should be provided. Have the iron tanks set in brick or stone frames, with a fireplace below. It is best to have two tanks, each with a capacity of about 400 gallons. If a home made tobacco dip is prepared from the leaves there should also be provided two iron infusing caldrons, each with a cover and with a capacity of 80 to 120 gallons. The infusion is prepared in these smaller tanks, while the bulk of the water is heated in the boiling tanks or in the swim itself. If a lime and sulphur dip is

Boiling, Infusing and Settling Tanks.

—The arrangement of the boiling tanks depends upon two factors in particular: First, upon the kind of dip used; second, upon the arrangement adopted for keeping the bath at a proper temperature. In case a steam pipe is placed near the floor of the dipping vat in order to keep the ooze at its proper temperature while dipping, the vat itself

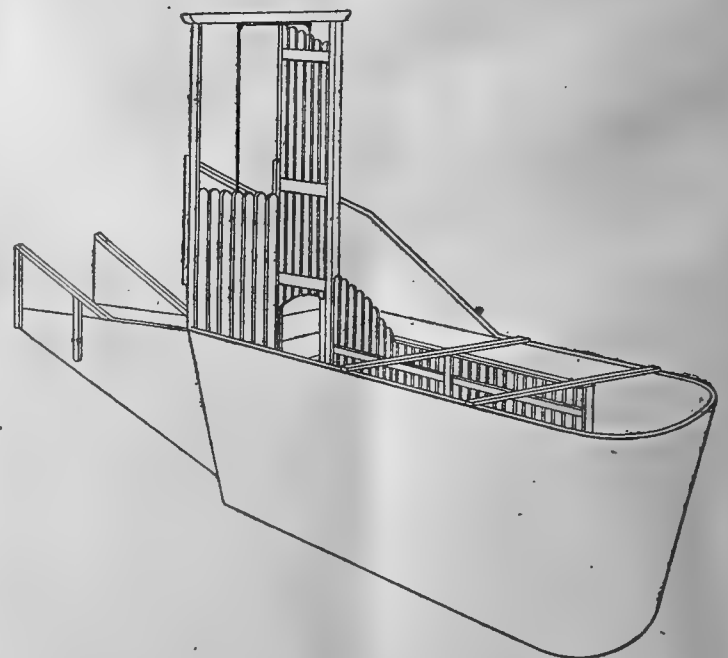


Figure 31. View of Double Oblong Swim. (Consult also Fig. 32.)

used, it is absolutely necessary to provide some means for settling the mixture in order that the bath may be free from sediment. You may do this in two ways. The better way is to have separate settling tubs provided with bung holes or pipes 3 or 4 inches from the bottom. After the mixture is thoroughly boiled it is pumped into the settling tubs and allowed to remain there until it is entirely free from sediment; the clear liquid is then run into the dipping vat and diluted with warm water to the proper strength. Or the boiling tanks may also be used as settling vats. A pipe with elbow joint is run into the boiling tank 3 or 4 inches above the bottom; the opening of the pipes should point sidewise, not up. After boiling the proper length of time the fire is removed and the liquid allowed to stand until the ooze is clear; only the clear ooze is drawn off, the sediment remaining on the floor of the boiling tank.

Measures.—The capacity of your vat should be marked at different depths. The capacity of the boilers should also be marked in the same way. Mark them for every 100, 200, 300, or 500 gallons

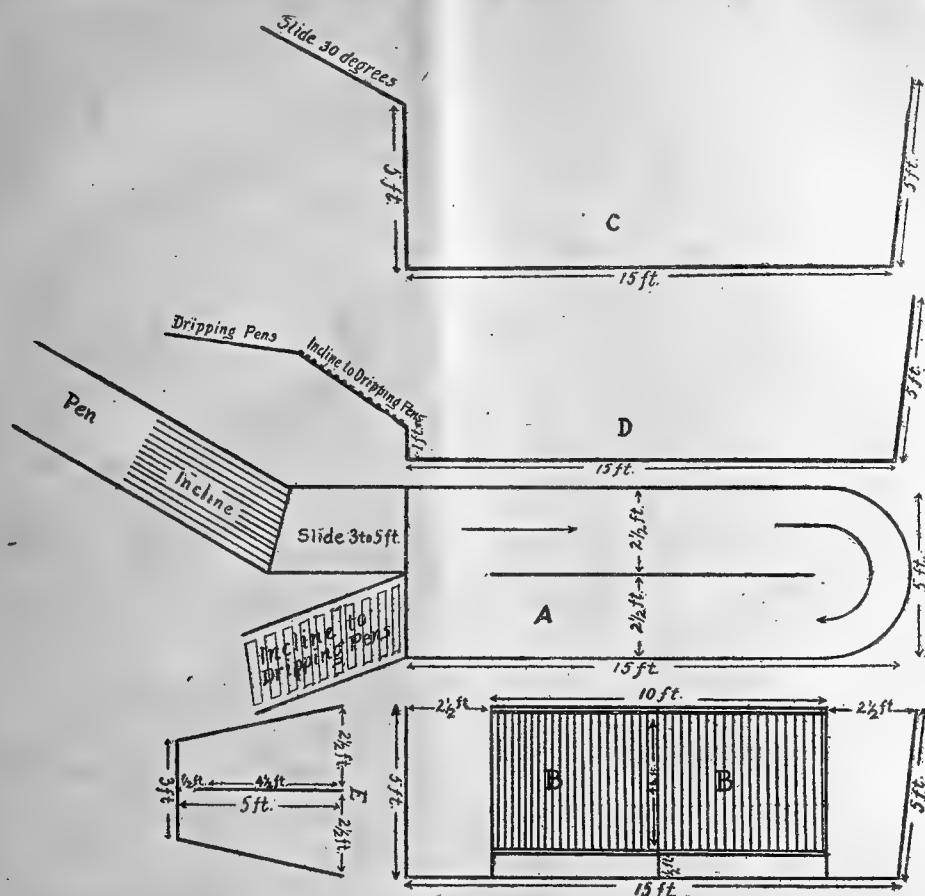


Figure 32.

A Double Oblong Vat: A, ground plan; B, side view of the middle partition; C, longitudinal section of the first swim; D, longitudinal section of the second swim, with incline; E, cross section of the entire vat, with partition in the center.

(according to the amount of dipping to be done), and you will have no need of separate measuring tanks. If your tanks are not marked in this way, it will be necessary for you to provide a separate measuring tank. It will facilitate matters for you to provide yourself with a portable pump to be used for filling and emptying the tanks.

IMPORTANT.

Be Sure to Read This.—There are numerous proprietary dips for the treatment of scab. Some of them are good, some bad, some indifferent, but none of them have ever arrived at anywhere near a state of perfection.

Realizing the importance of an absolutely safe and effective dip, we have been working for years in an attempt to produce such an article. Practically all of the standard reagents having the necessary qualities have been taken one by one and thoroughly investigated. Many times we have congratulated ourselves upon having at last reached the goal, only to find after exhaustive tests that one thing or another was not as complete or as perfect as it should be.

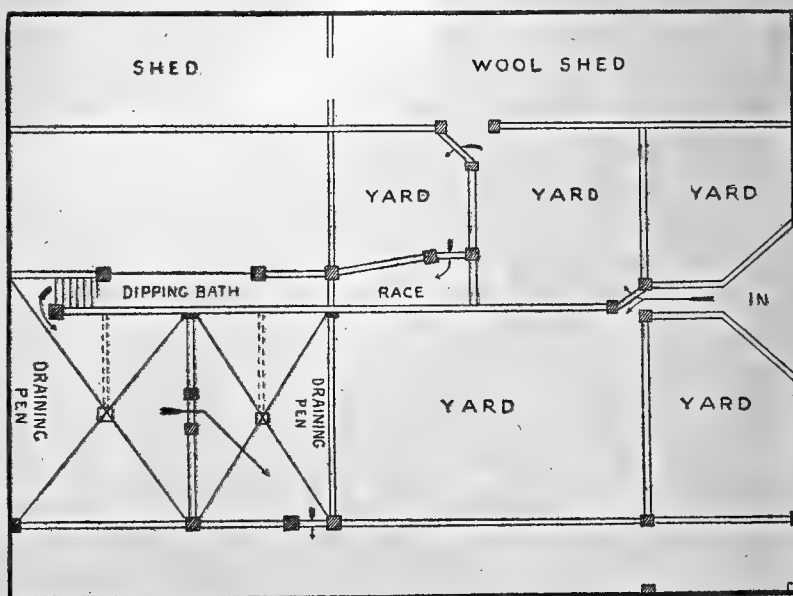


Figure 33. Ground Plan of Yards and Vat.

But we were firmly decided to offer nothing to the sheep raiser until we were able to produce an article that we could offer him and in all honesty recommend it absolutely, an article that we could honestly say to ourselves and to the sheepmen: "This is perfection." We have, we think, produced

in our laboratories dips that are even better than anything upon the market. We could have manufactured them and sold them and still have given the sheepmen something better than anything upon the market, and by so doing we could have increased our business materially. But in our entire line we have tried to attain perfection before offering, and we prefer to do the same in the dip line.

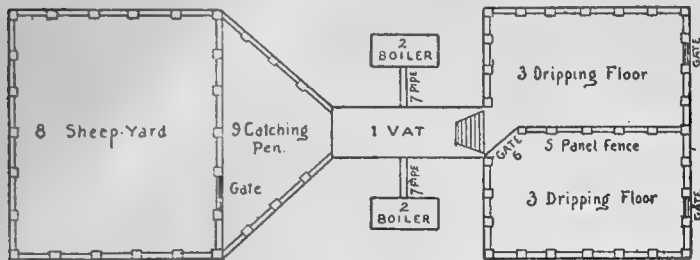


Figure 34. Ground Plan of Yards and Vat.

At the present time we feel that we have a preparation that is as near perfection as it is possible for man to make anything. We feel positive in our own minds that it is ready to offer to the sheepmen. But it will be a matter of four or five months before we can complete our tests and satisfy ourselves on every point. After having conducted these tests, should the dip meet them all satisfactorily, we will then be in a position to offer the American sheepmen a sheep dip that is so far ahead of anything that even the government has ever recommended, that we feel we will have contributed little short of a blessing to the sheep industry.

Before you purchase a dip from anybody it will be to your advantage to write us and find out what progress we have made, for, even after we have perfected our dip and our investigations are concluded, it will then take some time to get our packages and properly place the dip upon the market; but when it is placed upon the market you may rest assured that it will be as near ideal as it is possible for man to make it.

SPECIAL DISEASES.

Anthrax Fever,

or Braxy, is a disease common to almost all animals, dangerous and contagious in its nature. Rivers and streams may become contaminated with its poison from dead carcasses, and it is asserted that it is equally infectious and destructive to the aquatic life with which it comes in contact in the water. It is due to a specific germ, and although known under different names in different localities, it is, when analyzed, the same affection, produced in the same way. In the human we often call it malignant postule or wool sorter's disease; in cattle it is anthrax fever, splenic apoplexy; in France, charbon; in Germany, milzbrand; in India, loodian. In the sheep it is called braxy in America, while in England they call it great head, and in Australia, Cumberland disease. It may best be commonly defined under the name anthrax. A rod shaped, spore bearing bacillus, termed the bacillus anthracis, is in all instances responsible for its appearance. The disease is an ancient one, mentioned in the oldest literature of the world.

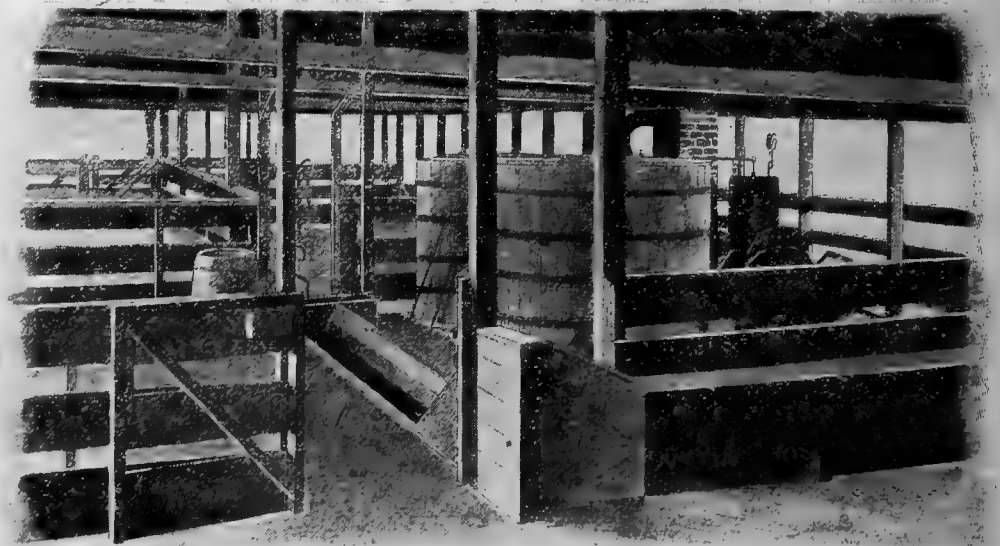


Figure 35. View of the Dipping Plant at the Stock Yards, South Omaha, Neb.

Causes.—It is said that pastures bordering on streams and rivers, especially such lands as are inundated annually, are prolific breeders of anthrax, the germ of the disease presumably being carried there from other localities, where animals have been infected and died of the disease. Hay from infected fields also may produce the malady, the straw and blades of the grass containing spores, which are transferred in turn to the animals. Insects and flies also may spread the infection. Dietetic errors seem to predispose the system to attacks from anthrax, more especially so when changing from poor to highly

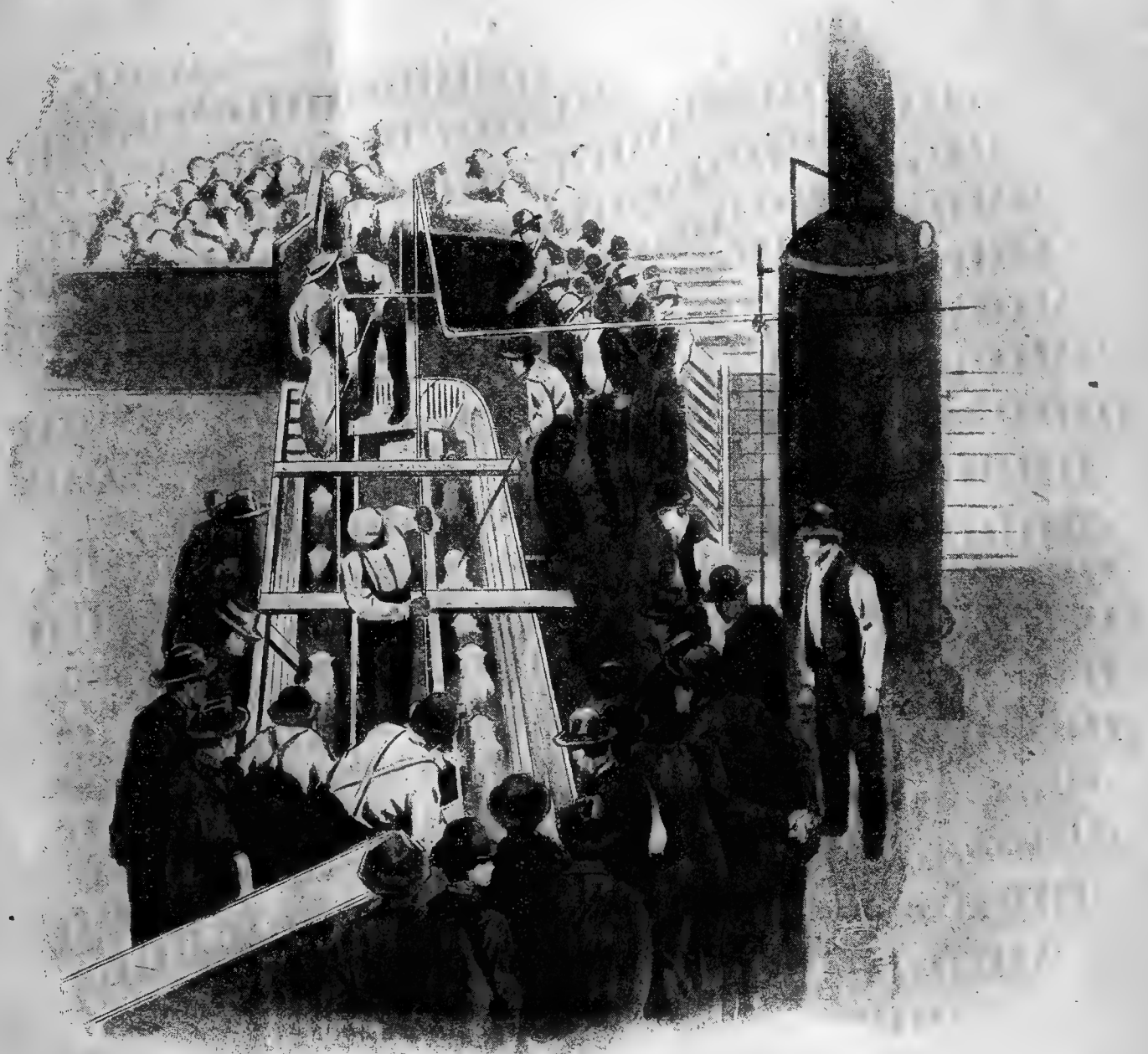


Figure 36. View of the Dipping Plant at the Union Stock Yards, Chicago, Ill.
(This dipping plant, including vat, boiler, etc., cost about \$2,500.)

nutritious feedstuffs, containing a high percentage of nitrogen. Other predisposing causes are a plethoric condition, the fattest sheep in a flock generally being the first to be attacked, moving of sheep from poor to rich pasturage, forced feeding, grazing on fields where animals recently have succumbed to the disease, etc.

Symptoms.—Feverishness; loss of appetite; head hanging down; ears cold to the touch; sheep stupid, dull, at times delirious; frequent attempts at urinating; urine scant and brownish colored; animal lies down and refuses to get up; there is more or less constipation and apoplectic symptoms; a mucus

discharge streaked with blood may run from one or both nostrils, the fecal matters also containing a quantity of blood colored fluid; carcass may swell, more especially head and legs. It is well for the sheep owner, if he finds some of the above symptoms present in his flock, still is not satisfied with himself that the disease really is anthrax, to call in a skilled veterinarian, in order to have the affection properly diagnosed in time. In almost all cases an outbreak of anthrax can be prevented or checked by inoculating the healthy members with Pasteur's Vaccine, and removing the entire flock to new fields.

Treatment.—Prevention is the only treatment for this disease. Once attacked the subject often dies before even showing any appreciable signs of sickness, the progress of the disease being marvelously swift. First find out whether anthrax really exists in your flock. Then immediately remove the sheep to fresh fields and use Pasteur's method of inoculation with the Davis Outfit, vaccinating all the healthy members of the flock. This treatment is the injection under the skin of the hind leg of an attenuated virus of the disease prepared at the Pasteur laboratory in France, and obtainable in all large cities. Once inoculated with this virus sheep become immune to attacks of the disease and never contract it under any circumstances. In Europe inoculation of sheep for this disease is widely practiced, with the result that it has been greatly diminished and the percentage of losses resulting from it is constantly growing less. Be very careful in handling animals which have succumbed to this disease, as man may be infected, with the result that bloody postule is produced by the anthrax blood; the smallest abrasion or scratch being able to cause the infection. Wool sorter's disease also may be caused by inhalation of the dust or fine powder arising from a sheep suffering from anthrax.

Blackleg,

in popular language also known as Quarter Ill, while the technical name is emphysema infectuosum, is an anthracoid disease, due to a germ producing a disease which manifests many of the symptoms common to anthrax fever.

The best feeders in a flock usually succumb the quickest, as is the case also in anthrax. Methods of infection also are similar. Marshy meadows, low lying pastures and lands bordering on rivers and streams are fertile localities for harboring and spreading the germ. The pastures in which sheep have succumbed to this disease reek with its germs, readily infecting the grazing animals. This is more especially the case where carcasses of sheep that have died from the disease have been permitted to lie above ground and rot, the grass subsequently growing up about them being almost sure to infect any sheep partaking of it. Therefore, be sure to bury or burn sheep that have died from blackleg as quickly as possible.

Symptoms.—Dullness; sheep may be off feed; slow in movement and very lame either behind or in front, as the disease may be located; animal may be down and unable to rise, in which case there generally is a swelling of a fore or hind quarter, consisting of air under the skin, a crackling sound being produced when you pass your hand over it. Skin is of a bluish color; symptoms in general very similar to those of anthrax fever.

Treatment.—No medical treatment is of any avail; prevention is the only cure; the Pasteur method of inoculation with the Davis Outfit is now used with great success both in America and abroad. Burn or bury all animals which have succumbed to blackleg, using quicklime in the burying process. Quarantine infected pastures, and thoroughly dress them with lime. This done, and the healthy members of your flock vaccinated, you will soon get rid of this destructive disease among your sheep.

Foot and Mouth Disease.

Scientifically known as Eczema Epizootica, and in popular language also known as Infectious Aphtha, is a fever attacking sheep, cattle, pigs, poultry, dogs and sometimes man. It is known all over the world, is highly contagious, and manifests through eruptions or postules in the mouth, around the coronets just above the hoofs, and in the clefts of the digits, the eruptions speedily breaking and forming ugly sores, which spread and unite with equal rapidity. It is due to a germ, and the infection is contained in the saliva and excretions. An attendant may carry it from animal to animal; the excretions from

the sores, also contain the contagion; grazing animals may infect pastures in a wholesale way, and dogs and other animals may carry the virus on their feet from one place to another, etc. The mortality from the disease, however, is not great.

Symptoms.—There are four stages of the disease, in the first of which fever appears, alternated with shivering fits; pulse being rapid, temperature high; patient is dull; nose dry; in suckling ewes the milk secretions cease; head feels hot; urine is scanty, sometimes there is salivating from the mouth. The second stage commences in the course of two or three days after the disease has been contracted, and is indicated by vesicular eruptions on various parts of the body; feet swell, animal is more or less lame; vesicles show plainly around the vulva of the female, the coronets, between the toes (digits), also on the teats of the female, more rarely in the mouth. In the third stage the vesicles break and discharge; there is ulceration, and the ulcers generally spread rapidly and combine. There is great sloughing of the skin above the hoofs, sheep kneels to eat, maybe moving about on its knees. In the worst cases the sloughing may extend into the joints, causing joint opening, a dangerous condition. After this stage, varying in time from four or five days to several weeks, the fourth sets in with the drying up of the ulcers, sores in the mouth heal up, appetite increases, and in the majority of cases the patient soon recovers.

Treatment.—Bathe the feet. Have shallow troughs made, fenced at the side, and let the sheep walk in them going in at one end and out at the other; mix the following medicinal agents in the water: Carbolic acid crystals, 10 ounces; acetate of lead, $2\frac{1}{4}$ pounds; sulphate of zinc, $2\frac{1}{4}$ pounds; water, 12 gallons. Mix this together thoroughly and put it in the water of the trough, then let the patient wade in it two or three times daily, and see, too, that the lame sheep is not permitted to hop through it on three feet, but properly immerses all four legs. Stir well each time before driving the patient through it.

Erysipelas is an affection of the skin caused by a germ called the streptococcus erysip-
elatis. In its nature it is extremely contagious and malignant, and when
gaining entrance into an abrasion or wound of the cuticle, serious inflammation
may result, which may penetrate into the underlying structures. The sheep is more liable to contract
this disease after shearing than at any other time, the reason being injury to the cuticle sustained in
the shearing process. All wounds of the skin may produce it. Ewes suffering from the effects of the
lambing process are also prone to become affected.

Symptoms.—Feverishness; swelling of the skin, which is hard and tense to the touch; small
blisters in great multitude will be found on the spot beneath the wool, each containing a red, waterish
fluid; infected spot at first circumscribed, quickly enlarges its circumference, often spreading quick
as wild fire, as the popular saying has it.

Treatment.—Apply Phenalin to the affected surface, or, if this is not at hand, some other
good antiseptic wash. Give a good dose of Epsom salts, quantity depending on the condition
and age of the animal; administer Davis Stock Food in double doses in the feed. After washing
with Phenalin, use a good liniment, such as Davis Veterinary Liniment, or camphorated oil, that will
soothe and relieve the heat.

Red Water. This is often met with in suckling lambs, also in lambs already weaned or fed
by hand. Mature sheep also may contract it. Its course is rapid, usually
fatal, and patient often succumbs in six hours' time.

Causes.—Watery feed; hoar frosted turnips, which do not contain flesh and fat forming substances
in sufficient quantity; succulent grasses; clover wet with the early morning dew, etc., have produced
the disease.

Symptoms.—Suspension of rumination; dullness; staring look in the eyes; bowels usually are
loose; belly appears enlarged; discharges are fetid; patient also at times constipated; breathing is labored;

there may be more or less swelling under the jaws and lower part of the neck; patient may drop dead suddenly, without symptoms of any kind; there may be giddiness, the animals falling down on one side, rolling over, becoming delirious, with death ensuing shortly afterward. When the lamb is attacked it usually lags behind the flock, falls down and dies suddenly without symptoms of any kind.

Treatment.—Change the plan of feeding. Substitute dry feed for turnips or a too succulent diet, and give each adult sheep 1 tablespoonful of Davis Stock Food to each feed, lambs in the proportion of $1\frac{1}{2}$ teaspoonful. No medical treatment is of any use once an animal is attacked, but you should take this as a warning to immediately remove the flock to drier pastures, and feed as per above advice.

SIMPLE SURGERY.

Castration.

As to what age this operation should be performed there is considerable difference of opinion, the popular belief seeming to be that the operation should be performed as soon as possible after the lamb is dropped, say from two to three weeks old. With favorable weather, the lamb being in normal health and strength, this probably is the best time. The claim is raised by some that if the lamb is allowed to run until three or four months old, before the castration takes place, the sheep will grow larger and stronger. What we here are mainly concerned with is the way in which to perform the operation correctly.

How to Castrate.—Select favorable weather, not too cold nor too warm. Place lamb on its rump, make sure that rupture of any kind is not present; now, this done, with the thumb and fingers of the left hand take hold of the end of the scrotum and pull it down, then with the knife in your right hand cut the end of the sac clean off. Now grasp the upper end of the scrotum, squeezing the testicles down and protruding through the opening, then with the scalpel or knife cut a longitudinal incision across each testicle, severing the tunics, but not necessarily cutting the testicles; now take hold of the testicles, one at a time, and draw them down gradually, twisting the cord and scraping it as you draw, until at length it becomes severed. The cord should be drawn out as long as possible in a long slender thread, in order to prevent excessive bleeding from the spermatic artery. This can be almost wholly done away with if above method of drawing out the cord is carefully followed. If the castration takes place in the fly season, a carbolic salve should be employed for the dressing of the wound, in order to prevent insects and maggots from pestering the patient. Strict cleanliness in every particular should be observed if the operation is to terminate successfully; and if this is done, and the methods described followed, almost all operations are sure to terminate favorably. If the operator or any of his instruments, water, knife, scalpel, etc., are not scrupulously clean, tetanus may follow. Do not use any of the more elaborate methods in vogue in some localities, for instance, searing the cord with red-hot iron, etc. This is likely to be followed with serious and at times fatal results. Just so with the tying of the scrotum between two pieces of wood until it sloughs off, is an antiquated, slow and cruel process, the simple operation we have just advocated being sufficient,

Docking

should be performed at an early age, the time of castration being preferable. The tail of the sheep is a useless incumbrance and may as well be removed, especially as it is liable to collect mud, dung, and other filth. Simply cut off the tail with a knife without any after treatment, or if convenient, you may sear the cut for a moment with a red-hot iron, which will check all bleeding at once. Always dock your ewes, whatever you may choose to do with your wether lambs.

Spaying,

or castration of the female, which consists in removing the ovaries, is an operation seldom performed in the sheep, as its advantages are slight. It may be done by placing the sheep on its back on an inclined heavy board or plank; have assistants hold her securely in this position, then make an incision back of the navel, running backward toward the mammae about 2 inches in length, cutting through the skin and underlying tissues, laying

open the abdominal cavity; this should be pierced by inserting the knife at right angles to the body of the subject, the opening being widened sufficiently to permit the insertion of two fingers (the two first fingers of the hand); with these reach backward and slightly to one side, and you will find the horn of the uterus; trace this forward until the ovary manifests itself, situated on the extremity of the cornua; bring this ovary to the surface and while you hold it with one hand use the fingers of the other to trace and secure the other ovary, the keeping hold of the first helping you largely to find the other. Twist the two organs (ovaries) off to prevent bleeding; do not use a knife for this operation. Now return the horns of the uterus to their place in the abdominal cavity and bring the lips of the incision together with sutures. Take deep stitches, first penetrating the skin, abdominal walls and peritoneum, then follow up with two surface ones through the skin, bringing the edges of the cuticle together in the original position. Do not bring the edges of the wound very tightly together, as the resulting inflammation (some inflammation will always follow the operation) will tear out the stitches, and may produce fatal consequences. Pine tar, or agents of this nature, to keep the wound in an aseptic condition and to keep flies and other insects away, should be the after treatment. If you have not studied up animal anatomy to some extent, not being conversant with the position of the various organs in the abdominal cavity, you would better call in a skilled veterinarian than try to perform this rather delicate operation yourself.

Abrasions, Fractures, Etc.

When a bone is broken without harm to the soft tissue covering it, we call it a simple fracture, while where there is an open wound connecting with the broken bone, it is known as a compound fracture. If the bone is shattered into fragments, or fine splinters, and serious injury to the adjacent tissues exist, it is called a complicated fracture. The treatment should consist in bringing the ends of the fractured bones in apposition, holding them together by a plaster of paris cast; if the wound is properly attended to in this way the sheep may be depended upon to do its share in nursing the broken leg or bone, and there is hope of recovery. However, in cases where legs have been broken, if the sheep is not of especial value as a breeder, etc., you would better give up treatment, and sell it for meat.

DISEASES OF THE EYE.

Simple Ophthalmia

is an inflammation of the membranes of the eyelids. Foreign matter gaining entrance to the eye, or bites from mosquitoes or other insects may produce it; complications from other diseases, or exposure to inclement weather, may produce it.

Symptoms.—Swelled eyelids; eye is half closed, drawn into its orbit; tears secrete copiously and run down the cheeks. Conjunctiva of the eye on examination will be found to be red and congested, dark red streaks covering it.

Treatment.—Foreign substances, having entered the eye, should be carefully removed. If these are embedded in the eyeball it is better to call in a veterinarian. After treatment bathe the eye with cold water, and apply Davis Ophthalmia Specific. In case the membrane of the eye has been cauterized by lime or other similar agents (as for instance after the lime and sulphur dip) make use of a soothing, lubricating medication, as, for instance, a few drops of linseed tea, or a kernel of flaxseed inserted under the lids. This will ease the pain and help to remedy the affection. Feed double feeds of Davis Stock Food.

Ophthalmia Proper,

popularly known as the Blinds, is an inflammation of the conjunctiva of the eye, its symptoms being very much the same as in the trouble just described, with the difference that while the former is caused by introduction of foreign substances into the eye, or complications from nasal catarrh or other diseases, this is usually produced by an epizootic, and appears in successive stages, each succeeding attack being more severe than the former, resulting as a rule in total blindness. Its cause is obscure, but it is not believed to be contagious; symptoms similar to those in simple ophthalmia, but constitutional disorder and a tendency of the affection to result in blindness distinguishes it from the milder form.

Treatment.—Essentially the same as for simple ophthalmia, but start in with a physic; as, for instance, 4 ounces of Epsom salts; apply cool, soothing ointments to the eye and Davis Ophthalmia Specific as described.

Eczema

is often met with in the sheep family, especially in lambs and younger animals, subjected to forced feeding for exhibition or similar purposes. Of the several forms in which eczema appears it is found that the vesicular is the most common in sheep. It may appear very suddenly, as a rule attacking the lips and face first; the skin which is most sparsely covered with fleece is also liable to be attacked, favorite spots being beneath thighs, arm pits, etc. Immediately intense itching appears, animal rubs itself against all protruding objects, little eruptions appear on the affected surfaces, soon breaking and discharging a thin, watery fluid. When they dry up a little nodule will remain in place of each eruption, and the farmer may mistake these for the altogether different disease, scab.

Treatment.—Change the method of feeding. Wrong or forced diet is almost always to blame. If it is necessary that the animal be forced for any purpose, always allow 1 teaspoonful of Davis Stock Food in each feed to the adult sheep and $\frac{1}{2}$ teaspoonful to the lamb, thus keeping the digestive and circulatory functions in proper condition and insuring against the disease. A saline cathartic, such as Epsom salts, should be administered. Liniments, such as Davis Veterinary Liniment, applied to the skin, also are good. A soothing and cooling lotion, such as the following, will help to keep the animal from rubbing and squeezing against convenient objects to alleviate the itching, thereby tearing the wool from the skin until the sheep presents a haggard and ragged appearance: Acetate of lead, 4 drams; water, 1 pint. This should be applied to the affected surface twice or thrice daily. Pulverized boracic acid is also good for this purpose.

Foot Rot.

A disease very common among sheep. So far as investigations up to the present time have discovered it is non-contagious, although as yet there exists some doubt upon this point. It is a widespread affection and large losses are sustained every year by sheep owners through its presence in the sheep flock. Still, it is not, as a rule, a fatal disease, but the fever and irritation produced by it is likely to retard the growth of the animal, with such symptoms as loss of flesh, unthriftiness, and general indisposition and sluggishness manifesting.

Causes.—Damp, marshy, wet and low lying pastures, causing the feet, hoofs and ligaments to remain in a constantly moist and wet state. This will cause an apparent increase in the size of the hoof, with visible blanching of the tender membranes of the feet. Then, if the weather changes, the ground drying up, a reaction will set in. There will be an increased circulation to the feet which had before been constantly moist and saturated. The hoof will swell or be pushed from the parts beneath; there is inflammation of the tissues between the claws; coronet is enlarged; heels bulge; abscesses may form; purulent matter exudes between the horn and substance beneath. In the most severe cases the hoof drops off entirely. This renders the sheep practically valueless except as butcher's meat.

Symptoms.—Sheep appears lame; pains seem to be present when it walks; on examination of the feet a purulent fluid will be found oozing out between the claws; the feet affected are hot, with swollen coronet; one or more feet may be affected, but seldom all four feet together; generally it is both fore feet or both hind feet at the start; disease, which to commence with is restricted to the feet, may later extend, forming sores and abscesses over the hoof, sometimes affecting the tendons of the knee. In the progression of the disease the horn of the hoof rots away and falls off; the tender laminae underneath are thereby exposed, and sprout outward, fungous growths are formed looking like large granulating tissue; when touched they bleed easily; fluid from the diseased parts is offensive in smell, being perceptible from a long distance. Later the horny sole of the feet is affected and peels off, exposing the sensitive parts of the pedal bone. There is great lameness and pain in walking; if the fore feet are the ones affected sheep will lie down, bending the two legs up under it and crawl along on its knees; if the hind legs are affected it will move along on its belly; often it lies down and will not rise up for hours; it drags itself painfully after its fellows, falls off in flesh, sheds the claws entirely in the most severe cases, and death may ensue from malnutrition, owing to its inability to feed properly. Flies congregate about it in swarms in the summer, sores are filled with maggots, and the sheep is in such a condition that killing it, on the part of the owner, is practically the only recourse and an act of mercy.

In its first stages foot rot is not complicated with constitutional fever; the appetite, as a rule, is good; ewes suckling lambs continue to secrete a liberal supply of milk, and the only disease present is the local affection of the feet, as a rule, two of the feet only at the start. The eruptions or vesicles occurring in foot rot are always local, confined to the members affected, not spreading to any other part of the body, as is often the case in foot and mouth disease. It is also distinguished from the latter by its apparent non-contagious character. (As intimated, some doubt exists upon this point, the authorities disagreeing.)

Treatment.—First of all be prompt. Construct a foot bath, according to the following method, and drive the flock through it several times each week: Provide yourself with a shallow trough, about 18 inches deep and 2 feet wide, as appears to you best; place this into the ground. Erect a low fence running the full length on each side, forcing the sheep to stand in it; previous to this make up the following preparation of arsenic: Carbonate of potash, 2 pounds; arsenious acid, 3 pounds; water, 14 gallons. Boil the potash and arsenic in the 14 gallons of water for half an hour or more, so that they may dissolve thoroughly. Then pour a sufficient quantity of the solution into the trough, at least 3 inches deep, or enough to cover the hoofs and coronets of the sheep thoroughly. Pare all the sheep affected before driving them into this bath, removing all foreign growths. If you have made the trough sufficiently long (20 to 30 feet) it is unnecessary to keep the animal standing in the bath for any length of time, just let them pass right through. You must not allow the sheep to graze after passing through the bath before the solution has dried from their feet, as the dripping of the arsenical liquid on the verdure partaken of would cause poisoning of themselves and other animals. It is therefore well to erect the trough in some barren place, removed from the farm buildings, and build a pen at each end of the trough to facilitate the operation. Then you simply first drive the sheep into the pen at one end of the trough, thence passing them in turn through the trough, and using the pen at the outlet as a drying place, holding the animals there until their feet are thoroughly dry. Provide a watertight lid for the trough and keep it locked up except when in use, to secure against danger to your other live stock. If the attack be a mild one you may substitute the arsenical bath with sulphate of copper (blue stone), using this in the proportion of 1 pound to each gallon of water. After the bath you will do well in applying quicklime to the feet of the sheep, which may be done by sprinkling the floor of an outhouse with the quicklime, and driving the flock into it. Now, you should bear in mind that the original cause of the disease without a doubt has been due to damp, swampy, pasturage, where the feet of the sheep were kept wet all the time, and you must change this before any good can result from the treatment. If, as is sometimes the case, a sandy or gravelly soil is to blame, this, too, must be exchanged for one better suited to the health of the animals. If you have no facilities for changing them around like this the best you can do is to house them over night in pens covered with sawdust or in barns where the floor is dry and comfortable. If only a few sheep of a flock are affected they should be caught and trimmed; that is, the diseased members (feet) must be pared down; you should carefully remove all shreds of horn or fungus; cauterize the torn and ulcerated places in order that the secretions of the healthy horn may have an opportunity to act. Sulphuric acid, nitric acid, creosote, etc., may be used for this cauterization; butyr of antimony is recommended as that which gives good results without undesirable complications of any kind. After treating the affected part in this way, dress with carbolized tar or Stockholm tar, which will help to produce the growth of healthy horn from the diseased surface. In case of profuse granulations, cauterization with a red hot iron is advisable. If ewes are in lamb, they should not, except in severe cases, be subjected to any other treatment than the walk through the copper or arsenical solution described above. If you remember that foot rot, as a rule, occurs on damp, swampy land in rainy weather, or, reversing the case, on dry land in torrid weather, where the ground is hard and hot under the feet, under such circumstances you will do well in always keeping a careful watch on your flock, and on the first symptoms of the disease manifesting itself adopt proper measures to prevent its becoming general among the sheep.

Parturition. The act of the sheep giving birth to the lamb after completion of the period of gestation, which in this animal extends over a period of five months, or, to come nearer still to the general average, from 145 to 150 days. There is a marked nervous disturbance at the last stage of gestation, the womb in its effort to expel the now full grown fetus making violent contractions. The act of birth itself is very much the same as seen in all mammalia,

consisting in successive contractions and efforts as the labors progress. During the act the pains grow in intensity, until through the expansion of the genital organs attending upon the continued efforts, the vagina and womb become one large distended cavity, and the delivery takes place. In the case of sheep producing twins they may be born immediately one after another, or several days may elapse between the first and second birth. Keep the ewe quiet and comfortable during the period of gestation in order to guard against premature delivery. Improper hygienic surroundings, dietetic changes, chasing by dogs or children, etc., may be followed by abortion and result fatally to the sheep. In order to have ewes fit for breeding and producing healthy offspring, the owner should bear two things in mind: The first is that he must see to it that the ewe is well nourished, feeding her on special feed if necessary and adding Davis Stock Food to the ration. An emaciated, debilitated mother is unfit to bear and may die during delivery, the act and pains being doubled and trebled in length and severity. Another thing to bear in mind is that the period of gestation should be so arranged that the delivery of necessity must not take place in very cold weather. This is often fatal to the ewe as well as the offspring. If tumors or other obstructions should exist in the genital organs, they must be removed before the birth of the lamb. In cases of rigidity of the tissues leading into the vaginal cavity, from whatever cause, it may be relieved by applications of warm water douches, or smearing the entrance with extract of belladonna. Sometimes an operation may be necessary to produce delivery and this should be performed as follows: Bare the arm to the shoulder and disinfect it in the same way as directed in the chapter on parturition in the cow, then pass the hand into the opening in the vagina. This, being much smaller than the opening in the cow or mare, is not always an easy matter, but by using a liberal amount of vaseline, being careful not to lacerate the membranes, it may be done; now pass a probe pointed bistoury into the vagina and make three slight incisions, one in the upper floor, and two extending to both sides, beginning where the upper one left off and running sidewise and downward. These incisions are made in the so called os, about midway in the vaginal cavity, and rightly done the operation will enable the animal to make delivery. However, it must be done by a skilled hand, and you should not attempt to do it yourself until you have seen it done by a veterinarian a number of times. Such an operation must not be resorted to except as a last resort, as it unfits the ewe for subsequent breeding. If malposition of the fetus exists, making it impossible for the mother to deliver it, and if you are not used to handling such cases, you had better call in a skilled veterinarian, watch him working, and then you may learn by degrees how to perform the operation. In all less complicated cases of this kind, however, you can readily perform the operation yourself. Thus, if the head and one fore leg only is presented, as gently as possible press the fetus back into the cavity, get hold of the missing leg, bring it in position with the other, and then let the mother take care of the rest. Always vaseline hands and arms well when you make these operations. In the same way, if the head alone is presented, both fore legs missing, press back the head, get hold of the missing legs, bring them in natural position with the head, and let the mother proceed with the delivery. If the two fore legs protrude, but the head is missing, bring your vaselined hand gently into the opening, find the head, put a finger into the mouth of the fetus or get your hand around its snout, catching hold gently but firmly enough to bring the head out and in natural position with the two legs. If the side of the fetus only presents in the opening, the entire body must be so turned as to bring it into the natural position (fore legs and head protruding). This requires some skill, patience and judgment, and if you are not used to doing it, better have a veterinarian show you how; the same holds good where the back only is presented. If the fetus should be turned backward in the womb, the breech presenting with the hind legs missing, you can bring about delivery by pushing back the fetus, standing it on its head until you can get hold of one of the hind legs, bring this into position in the opening, then repeat the process, bringing out the other, and assist the mother by gently pulling the lamb out backward. If the fetus is too large, it is necessary to cut it up and extract it piece by piece. This you cannot do until you have watched a skilled veterinarian do it a number of times. Too much care cannot be exercised in assisting delivery to keep hands and arms well oiled and scrupulously clean, also being careful that no foreign substances are allowed to enter in the process. If this is not done, septic poisoning with death of the animal is liable to set in afterward. Carbolized sweet oil may be substituted for vaseline to oil the arm and lubricate the passage. Be very careful not to lacerate any of the organs. If retention of the fetal membranes occurs after delivery (they normally are expelled promptly after

delivery, and if retained for twenty-four hours or over may cause septic poisoning) take the projecting portions, twist them around a stick, pulling gently and steadily. This, as a rule, will be all that is necessary. After the operation you may either give the ewe 4 ounces of Epsom salts, or the following preparation: Epsom salts, 2 ounces; nitrate of potash, 1 dram; powdered ginger, 1 dram; carbonate of ammonia, 20 grains. Dissolve this in 8 or 10 ounces of water and give it to the patient in one drench. Good effects may also be produced by administering this to the ewe a week or ten days before parturition is due.

Bleeding,

known also as Flooding or Postpartem Hemorrhage, sometimes occurs due to retention of the fetal membranes after delivery, or when they are too quickly and abruptly torn from their fastenings; great exhaustion, attendant upon painful and protracted labor, where the womb has been weakened and the contractions of the gland are imperfect, may also be the cause. It should be met by a quick and effective tonic stimulant, as for instance: Aromatic spirits of ammonia, 2 drams; alcohol, 2 drams; sulphuric ether, 2 drams. To this should be added $\frac{1}{2}$ pint of water, and it should be administered immediately as a drench. If, after this is done, the womb on inspection is found distended and full of clots of blood, inject warm water with a syringe and gently rinse it. After the cleansing process, administer the following: Tincture of iron, 4 drams; warm water, 1 pint. This should be syringed or otherwise injected into the uterus, after which cool off the vulva with cold water and give the patient 2 drams of fluid extract of ergot.

Prolapsus Uteri,

or Inversion of the Womb, may exist either partially or completely. If a new affection, discovered in time, it may be easily corrected, the inverted portion of the organ being washed with carbolized water, then starting at the farthest protruding part, press forward and inward, thus simply turning it back into its normal position. If the trouble has been allowed to go on for a prolonged period it may be necessary to sacrifice the organ, lightly criss crossing it with a knife, cutting nothing but the surface, applying common table salt, or a compound of salt, ginger and powdered allspice, then turning the organ back to its normal position. If gangrenous conditions exist, it may be necessary to amputate the entire uterus to save the life of the patient. Take a needle with a double thread, pass it through the neck of the organ, reaching in as far as possible. Now sever the ends of the thread close to the needle, thus producing four separate ends; then take the ends of one thread and tie an ordinary knot, making it tight, thus enclosing and effectually stopping the circulation of half the stem. Repeat the process, doing the same with the other thread, and thereupon sever the parts outside the suture with a sharp knife. When you have amputated the uterus, you must place the patient in such a position that the hind parts are raised. It is not advisable for you to perform this operation yourself until you have had a skilled veterinarian to show you how. The same holds good if after the womb in simple prolapsus has been returned into position it tends to fall outward again. It may then be necessary to suture with sterilized silk through the lips of the vagina, or employ other methods for holding the organ in place. Call in a veterinarian and have him perform the operation.

Vaginal Inversion

may be complicated with prolapsus of the womb or exist separately. It is akin to the former disorder. It is most often met with together with premature rupture of the fetal membranes, the waters escaping too early. Or the cause may be extraction of the fetus in an abrupt and brutal manner, causing laceration and tearing of the tender membranes which line the vagina, combined with the underlying tissues. This may produce a flaccid and nerveless condition of the organs, which in turn produces the inversion after the lamb is born; straining due to after pains also occasionally produces this condition, or abortion or retention of the fetal membranes may produce it. Lack of firmness and proper tone in the parts may produce it even in ewes that are not pregnant, just as injury of any kind to the parts or other abnormal conditions are likely to bring it about. The condition may easily be discovered by the projection from the vulva, forming a round, reddish, protruding mass, especially prominent when the animal is lying down. To the experienced eye of the stock breeder it is easy to distinguish between this disorder and inversion of the uterus; in vaginal inversion the protruding mass is perfectly smooth and on its under surface a furrow leads to the urethra, the entrance to the uteri in some cases being discernible in the middle of the mass. It is a disorder which needs prompt treatment if serious consequences are not to ensue.

Treatment.—Prepare a warm, soothing, antiseptic wash of Phenalin, apply this gently with a clean sponge, then, starting from each side, at the lips of the vulva, commence to turn the edges inward, continuing to apply the antiseptic with the sponge at intervals, gently handling and manipulating the mass until it returns to its natural position. If the organs have become lacerated in any way a suitable astringent may be required, and made up as follows: Lead acetate, 1 ounce; water, 1 pint. Dissolve the acetate of lead in the water, and add 2 ounces of laudanum. Inject this into the vagina, and if it is required you may insure against a subsequent inversion by taking a deep suture through the vulva. This must not be done except when absolutely necessary.

Vaginitis,

or Inflammation of the Vagina, usually is brought about by some injury sustained by the organ in the act of parturition; complication in the form of inflammation of the womb is often present, making it a serious trouble. It may be discovered by the swollen appearance of the lips of the vulva, the membranous lining of the cavity attaining a livid or deep red, inflamed color; the parts are then feverish, hot and dry, and the natural mucus secretion is absent. There is pain when urinating; intense itching; as the trouble progresses, the suspended secretion of mucus reappears in the form of a serous fluid, streaked with blood and turning into an offensive, purulent discharge. This, where the inflammation is pronounced, may assist in bringing about a gangrenous condition, the patient dying of septic poisoning.

Treatment.—Wash with warm water, then use astringent injections, same treatment as recommended in vaginal inversion may be resorted to. If there are symptoms of gangrene, administer iron and quinine internally and dress the organs with carbolized oil.

Metritis,

or Inflammation of the Womb, is a grave complication, which may be brought about by injury to the organs during labor, retention of the fetal membranes, introduction of septic material, exposure during parturition, etc.

Symptoms.—Hurried respirations; congestion of the visible membranes; face of patient is haggard and distressed; pulse full and throbbing; vulva swollen; lining of vagina red and inflamed; bowels constipated; secretion of milk suppressed; a reddish thick fluid (at the start clear) exudes from the vagina; patient lies down and can only be aroused with difficulty; abdomen may be distended; temperature in fatal cases remains high.

Treatment.—First give a good dose of Epsom salts. Or better, make up the following compound: Epsom salts, 2 ounces; common salt, 2 ounces; ginger, 1 dram; molasses, 8 ounces. Mix this thoroughly and give it to the patient in one dose. You should also be careful to place the patient in dry, warm and comfortable quarters. The sheep is a cleanly animal and you may improve its condition materially by seeing that its bedding is always fresh and sweet. Should the udder be swollen, bathe it several times a day with hot water, afterward applying a soothing, refreshing ointment, as, for instance, Benzoeated lard, 2 drams; poke root, powdered, $\frac{1}{2}$ ounce. Apply this gently to the inflamed surface. In case of malignant parturient fever, which is always caused by septic poisoning and erysipelas, a very serious condition, which may be carried from one ewe to another by the lambs, you may treat it in the same way as Metritis, the symptoms being also very much alike, except that they here are evidenced in an aggravated form. The progress of the disease is very rapid, and fatality common, coma generally being present before death. In treating it first syringe out the womb thoroughly with a warm antiseptic wash. You may use permanganate of potash to the extent of 1 dram in 1 pint of water, or carbolic solutions, one part carbol to forty parts water, are good. Internally administer iron and quinine, or salicylic acid together with carbolic acid; give often but in minute doses. Then use such agents as aromatic spirits of ammonia, alcohol, etc., to keep up the strength of the patient: Carbolic acid, m. iii; and salicylic acid, grs. x, dissolved in 1 ounce of gruel and given in a single dose, repeated every two hours, is the correct proportion for this form of treatment; or you may substitute with the following: Tincture chloride of iron, $\frac{1}{2}$ ounce; sulphate of quinine, 1 dram; water, 12 ounces. Mix this thoroughly and give it in 1-ounce doses, repeating every two hours. Then give the following as a stimulant: Aromatic spirits of ammonia, 3 ounces; alcohol, 3 ounces; sulphuric ether, 3 ounces. Give 1 ounce of this in 4 ounces of water, repeating every three or four hours. Warm fomentations to the inflamed udder should be frequently applied. Ointment of poke root and lard should be used as a dressing between the fomentations. Always take the lamb from the mother as soon as the attack is discovered.

Mammitis, also known as Garget or Mastitis, is simply congestion of the udder, due either to exposure, abrasions from contact with stony ground when the animal lies down, or it may be caused by the circumstance that the ewe only has one lamb, unable to consume the full supply of milk contained in the udder; it may also be a complication of parturient fever or other diseases of the genital organs. It is a frequent and serious disease in ewes, at times fatal, and at times causing a permanently enlarged, abnormal condition of the udder, unfitting the ewe for breeding purposes.

Symptoms.—Swelling of the gland, commencing as a rule at the teats, and spreading rapidly; secretion of milk is partially suspended; milk is often streaked with blood; swelling of the udder is hard and tense to the touch; if septic poisoning sets in these symptoms are aggravated and disease likely to result fatally. There are also symptoms of fever; patient is dull; appetite is lost; pulse is rapid and hard; rumination suspended; skin of the udder flaming red (in severe cases it may turn black with the setting in of mortification); there is gradual sloughing of the gangrenous portion of the gland; patient loses flesh rapidly, and blood poisoning may cause death. The disease is considered contagious, it is quick in its course, and death may ensue in twenty-four hours in severe cases. Even if the patient should recover, the udder is liable to remain enlarged and abnormal, and the ewe should not be used as a breeder any more.

Treatment.—Take the lamb from the affected animal; raise it by bottle, or transfer it to another ewe, if convenient. Bathe the udder in warm water, dissolving 2 ounces of baking soda in every quart of water. Dress the gland with camphorated oil after the wash. Internally give a good dose of Epsom salts (4 ounces) and if high fever is present, give aconite. In case of blood poisoning try quinine and iron, also poke root; anticipate the affection with this if possible. Administer the medicine in $\frac{1}{2}$ teaspoonful doses every three or four hours. If abscesses have formed, open them and press out the contents, then wash out the scars with an antiseptic fluid, keeping them clean and sweet. If gangrene has set in the only way is to amputate the part affected, and a veterinarian should do this by incising the parts inside the line of demarcation, thus preventing too much hemorrhage. After the operation dress the wound carefully with oil of turpentine, renewing at least once a day. The recovery from this affection is slow, and in the process the patient usually slips its fleece.

AFFECTIONS OF THE LAMB.

Asphyxia may be caused by an interrupted circulation in the navel (umbilical cord), too much pressure being brought to bear on it in the passage of the fetus from the womb. When you discover signs of asphyxia in the fetus during the act of parturition or immediately after, clean all secretions from the nostrils, close up the mouth, then blow into the nose. If you succeed in restoring the breathing, give the lamb a gentle stimulant or pour a few drops of brandy into the nose, then place it with its mother, where it can be warm and comfortable and it will soon recover.

Hemorrhage from the Navel, technically known as Umbilical Hemorrhage, may be caused by the cord being cut off too close to the body. Nitrate of silver, tannic acid, etc., applied as astringents, will usually effectually overcome this disorder. If, however, inflammation of the umbilical cord exists (the disease known as navel ill), the case becomes more serious, and may result in blood poisoning, often terminating fatally. As a rule the affection spreads from the umbilical vein to the surrounding tissues. A clot forms at the umbilicus, attended by suppuration and a pervious opening or fistula appears at the base of the organ. Ultimately the whole course of the vein, as far in as the liver, becomes inflamed, and the trouble results in death.

Symptoms.—In normal state the navel cord after birth dries and withers away. When inflamed it remains moist and gradually swells, projecting from the navel, being hard and unyielding to the touch, its size being about that of an ordinary penholder or pencil; it emits a thin, viscid fluid, without any

odor. Lamb is dull; prefers lying down; if made to get up it will stand with its back arched, drawing its feet together under the body; it does not show any inclination to suck its mother, breathes heavily, and seems to be in pain. These symptoms aggravate as the disease goes on; navel is swollen and painful to the touch; bowels loose; fluid from the cord becomes offensive, urine scanty, often red in color; membranes take on a yellowish hue, showing that the liver is implicated; there are swellings in different parts of the body; and the patient dies in the course of a short time after these appear.

Treatment.—Prevention. If there is a tendency to the trouble, the first thing to do is to observe scrupulous cleanliness around the patient. Be careful that the newly severed cord does not come in contact with a dirty floor or other filthy surfaces; immediately after birth anoint the just severed cord with Phenalin or some other powerful antiseptic. This simple remedy alone will in the majority of cases act as a deterrent of the affection, and not very many of the lambs will contract or succumb to navel ill, even in a large flock of sheep. If, however, the disease is once contracted, it will be found a difficult matter to treat or cure it. As a rule the patient will succumb. In case it does recover, it will take time and patience, and it will never amount to a very valuable sheep. Try the following treatment: Acid carbolic (sol.), $\frac{1}{2}$ dram; acid salicylic, 20 grains; water, 2 ounces. Mix this well, and give as an injection three or four times daily. Give antidotes or agents counteracting blood poisoning as internal treatment. Salicylate of soda, 10 grains every hour, giving 15 minims of the tincture of iron (med.), alternately, may be tried with good results. As a feed, fresh cow's milk, diluted with warm water in proportion of one-third, or warm skimmed milk should be used. The ewe should be well fed on a substantial nourishing diet, allowing her 1 teaspoonful of Davis Stock Food to each feed.

If the disease should appear in a flock in the form of an epidemic, you must first of all change the sheep from the old pastures where they have grazed to fresh ones, then carefully watch each lamb as soon as delivered, and if any symptoms of navel ill should be present treat it as above advised.

Abortion

means the expellation of the fetus from the womb in a semideveloped state. If dropped twenty days or more before the proper time of delivery, we call it an abortion. Various causes may produce this—inclement weather, climatic changes from warm to cold especially; cold drizzling rains, to which the ewe is exposed, may be the reason, or improper feed, overfeeding, too highly concentrated, stimulating feed, etc.; also too much cold water, moldy, smut covered grain, etc., sometimes produce abortion, and should so far as possible be eliminated in the care of the pregnant ewe. Still other causes may be sudden fear, the chasing of the animal by children or dogs, purgative medicines, neglect, starvation, tugging of the ewe by a ram. Last but not least should be mentioned bacteria, which enter the vagina of the pregnant ewe, and by setting up irritation and excitation, may produce abortion in a very brief period. This is by far the most frequent and serious condition causing the disorder, and deserves to be specially enlarged upon, it coming under the head of infectious abortion.

Infectious Abortion.

Scientifically we now catalogue this disorder as a specific disease, produced by bacteria entering the vagina of the ewe, the same having been demonstrated to be the case in pregnant dairy cows. It has also been conclusively demonstrated that it is a highly contagious affection, and if you introduce a ewe which is smitten with the disease to your flock of pregnant females it will be almost sure to cause a large number of abortions. Experiments so far have been restricted mainly to cows, but there is no doubt but that it is very much alike in both species of animals.

Symptoms.—Dullness; sheep refuses to feed; uneasiness; frequent bleating. These symptoms, at first light, quickly aggravate, then labor pains commence, and in the course of a few hours' time the abortion occurs. If these symptoms indicate the approach of the abortion it is generally the result of incorrect diet or fear, while if infection produces it there is but slight, if any, warning. It may be stated here that abortion in the ewe is often followed by inversion of the womb or vagina or both of these organs. After the animal has expelled the fetus it should therefore be carefully watched and treated as soon as symptoms of this trouble manifest.

Treatment.—Prevention is better than a cure, here as elsewhere. Change of pastures, as soon as tendency to abort manifests in your sheep, will often check it; of course you must separate the animals which already have succumbed from the remainder of the sheep. Look to the cause and remove it.

Should the season be cold and wet and the pasturage upon which the sheep have fed, low and swampy, immediately remove them to higher altitudes, if possible, and substitute the watery, succulent diet with one of dry fodder. If the pregnant animal has been exposed to excitement or fear, and abortion seems imminent, place her in a quiet, comfortable place, and administer a soothing nerve tonic—opium, chloroform, or viburnum prunifolium, given in teaspoonful doses as fluid extract—and you may stay the abortion. If, however, it should take place, at once remove the fetus and all its membranes, either burning or burying it deeply with quicklime. Be careful that your hands do not come in contact with any member of the healthy flock while you handle the aborting ewe and her fetus, as this may produce infection, and before you know it every ewe in your flock will abort. After the process of abortion, if any of the membranes are retained in the uterus, you may cause their expellation by administering the following preparation: Powdered fennel, 2 ounces; bicarbonate of soda, 2 ounces; laurel berries, powdered, 2 ounces. This should be infused in 2 quarts of water, and the patient given an 8-ounce dose every six hours or so, until relieved. If your flock is but a small one and it is practicable, you may, if you have cause to fear that infectious abortion has been contracted, wash the vulva and base of the tail with an antiseptic wash, as, for instance, Phenalin, or a 5 per cent watery solution of carbolic acid. This, as a rule, will have the desired effect, staying the act. In administering the wash see that a small portion of it is gently injected into the vagina. Of course, if your flock is a large one, it would not be quite possible for you to administer such individual treatment and the other methods suggested must be followed. However, whenever you fear that an animal is going to abort, it will be well for you to immediately separate her from the remainder of the sheep, and keep her by herself for a week or two. An exhausted ram, having served too many ewes, also at times is to blame for abortion; this you may remedy by limiting the number of animals to each ram, rather keeping a surplus of these in stock than have them serve in an exhausted condition. Feed the pregnant ewe rather sparingly, preferring dry feeds to watery, such as turnips, roots and succulent grasses; give 1 teaspoonful of Davis Stock Food to each feed, to keep the digestion and circulation in order. Always remember that the sheep, and more especially the pregnant ewe, is a high strung animal, requiring the best of care and attention, hygiene, sanitation and feeding, if you would culture her into a first class breeder, producing strong, healthy offspring.

There is no good reason why the sheep industry of the United States should not be the greatest of its kind in the world. On the slopes of the Pacific Coast, on the plains of Arizona and New Mexico, on the prairies of the great and prosperous Northwest, Minnesota, Nebraska, the Dakotas, and throughout the middle states, throughout the Rocky Mountain regions of the West, and winding in and out on the slopes of the Blue Mountain Ridge, in the fair valleys of Virginia; in short, at any geographical point throughout the length and breadth of America, are immense areas of land ideally suited for sheep pasturage, and often for nothing else. The sheep are a hardy race, and will live and thrive on pasturage where no other domestic animal could sustain life. If a little care and good judgment is used in its breeding, and the various diseases to which it is peculiarly liable, and which have been set forth in this treatise, are eradicated and eliminated from the flocks by the simple means suggested, it will, with less care and attention, pay better dividends to its owner than are derived from most of the other animal industries. If you take proper care of the digestive and circulatory functions of your sheep, always bearing in mind that the sheep in its nervous make up ranks among the most highly organized and sensitive of our domestic animals, it will live and thrive under almost any climatic conditions, yielding ample returns.

Davis Stock Food will prove an invaluable aid in making your flock profitable if the methods suggested are followed, always remembering that its first mission is to maintain the health of the animal and its constant use will pay big dividends. Its formula is your property; we have nothing to conceal and nothing to fear. We ask your confidence and take you into ours, knowing that it is to our mutual advantage.

THE HOG.

Odd and interesting indeed is the fact that the hog, one of the most valuable and indispensable animals in the domestic group which man has gathered around him for service and sustenance of life, is at the same time, one might say, the most despised among all the species, the contradiction going so far as to always identify and compare anything unclean, vulgar, low and filthy with the general make up of the hog. As long as we continue to depend upon the hog as one of our main sources of meat, it would be well for us not to heap any more abuse and contempt upon his fat shoulders than he actually deserves; and it is a fact, that if only the farmer will give the same care and attention to this animal as he bestows upon his other stock, guarding it as carefully against disease, seeing that the same amount of sanitation and hygiene is imparted into its care and quarters, the hog will in the main prove itself as cleanly and well bred a member of the inhabitants of the farmyard and pastures as any of his fellows. Treat him well, see that his quarters are kept as clean and sweet as possible, feed him properly, guard him against the diseases to which his family is liable, and you will find that the offensiveness and filthy conditions which before surrounded him as a halo will largely disappear. In this treatise we shall endeavor to tell you just how to treat your swine when affected with any of the diseases common to his kind; while in another part of this work you will find a general description of this much abused friend of man, whose meat properly prepared from healthy hogs furnishes a large percentage of the best and cheapest food available for the human race throughout the world. In treating upon the various diseases of the swine we are first of all concerned with what is popularly known as Hog Cholera.

Hog Cholera.

The yearly losses from this disease in the United States are without a doubt large. In this connection it should not be inferred that all the affections of the swine come under this same classification, as is believed in some quarters. The farmer not familiar with the specific conditions under which diseases may be separated and classified, having no means to ascertain the differentiation in symptoms and conditions under which disease appears in the hog, is prone to call all its maladies cholera. This, however, is wrong; for although it has been scientifically demonstrated that the conclusion of some of our most advanced and intelligent farmers, that there exists a widespread and destructive plague to which the name hog cholera may be appropriately applied, the United States Bureau of Animal Industry, which in a most thorough and systematic manner, with all necessary resources at its command, has conducted investigations along this line, at the same time has shown that side by side with hog cholera there exists another disease called swine plague, which seems to be almost as common and fatal as the former. In order to compare the two and show you in so far as possible how and where they differentiate we will go on with our story, alternately acquainting you with the symptoms and characteristics of both.

Hog Cholera and Swine Plague.

The two diseases resemble each other very closely in symptoms, and it requires an examination of the internal organs after the animal's death, in many cases even a microscopical study, to clearly distinguish between them. It is, however, fortunate, that, according to the Bureau of Animal Industry, it is quite possible to formulate methods for the prevention, cure and eradication of the diseases in question which may be applied with equal success in both instances. In fact, hog cholera and swine plague are not only similar in symptoms, but also in their effect upon the bodies of the affected animals. Both are caused by bacteria, and both must be combated by measures which will prevent exposure to

these bacteria or destroy them after they have once been introduced upon the premises. The sick animals must be treated with remedies which will reduce the fever, stop the multiplication of the germs, and assist the affected organs in resuming their normal functions. We are largely indebted to the Bureau of Animal Industry—the best source in the world without a doubt—for the valuable and excellent statistics upon which the following dissertation is based, we, in so far as possible, holding ourselves to its language and conclusions in our compilation.

The difficulty of distinguishing between hog cholera and swine plague is, for the reasons previously set forth, therefore, of no great consequence in the practical work of controlling and eradicating them with which the farmer is concerned. To know that one or the other of the two affections is present will as a rule suffice, because this knowledge leads at once to the adoption of the measures applicable to the treatment of infectious diseases. If you only are reasonably certain that your swine suffer from either of the two maladies in question, you may safely make use of the treatment recommended here, for the reason that the agents which destroy one of these germs will also, as a rule, destroy the other.

There are other infectious diseases which at times attack hogs, but they have either never been introduced into this country or have never approached in their destructive character the two diseases mentioned. The erysipelas of the European continent appears to be the most destructive of the swine diseases in the countries where it is known. But it is unknown in America. It was a few years ago proposed by enthusiastic though reckless investigators to introduce the virus of the erysipelas as a vaccine for the prevention of hog cholera; but subsequently the Bureau of Animal Industry demonstrated that the diseases were not similar; that hog cholera could not be prevented by the vaccine of erysipelas, and that the only effect of the proposed measure would be the introduction of a new plague, probably as destructive as the dreaded hog cholera itself. There is a disease known as anthrax, which may attack all species of the warm blooded animals and sometimes affects the hogs in limited areas of this country. The disease does not spread from farm to farm with the rapidity that is common with hog cholera, nor does it extend nearly so far in distance. When it does exist, cattle and sheep, often horses also, are likewise affected; and the hogs usually contract it from eating the carcasses of animals that have died with it. It is a disease confined to certain regions of the country, reappearing there year after year. It is not a common disease among hogs.

These are about the only diseases liable to be mistaken for hog cholera and swine plague, and as one of them has never been seen in this country, and as the other is infrequent and more often affects other species of animals, it is plain that any contagious disease confined to swine which breaks out in this country is in all probability either hog cholera or swine plague.

Characteristics.—Hog cholera and swine plague are both very fatal and destructive. They affect hogs in all parts of the United States, and cause heavy losses, which have been estimated to reach \$10,000,000 to \$25,000,000 annually. And it is impossible to say which of the two causes the greater losses, owing to their close resemblance, but both are spread by infection and are equally common.

Among young pigs hog cholera is especially fatal, and they are often attacked while the older animals go free. The latter have greater power of resistance to the virus, and this power, also known as immunity, is increased when hogs have been exposed and only so slightly infected that they have recovered after a short illness, without showing any of the evident symptoms of the disease. That is to say, if hog cholera breaks out among a herd of swine and is checked and apparently eradicated by proper treatment, the hogs that are saved are capable of resisting the contagion on the premises, while purchased hogs that have not been exposed will, when put with the others, contract the disease and die. This demonstrates that the virus has been left upon the premises and the hogs have been saved, not by the destruction of the contagion, but by keeping the infected hogs alive until they became immune. This is an important thing to know, and one which you will do well in always remembering when trying to guard against the disease in your herd.

The virus of the hog cholera is the more tenacious and resisting of the two, and is also more easily spread and communicated to healthy animals. Swine contract hog cholera by taking the virus into the body with the feed and drink, by inhaling it with the air, and less frequently its gaining entrance through the surface of a fresh wound. The virus of the swine plague, on the other hand, is generally, if not always, taken into the lungs with the inhaled air. The time elapsing between the infection and

appearance of the first symptoms of illness is known as the incubation period, and varies from four to twenty days. In the course of this period the germs multiply slowly and gradually overcome the vital powers of the animal by means of poisonous substances which they produce as the result of their growth. As soon as the first symptoms of the disease show you should at once take the infected animal in hand and place it under proper treatment, as hereinafter described.

Symptoms.—In the worst cases the animals die very suddenly, either before sickness has been observed or after they have been ill but a few hours. Such cases are met with most often when the disease first appears in a herd. As a rule, however, the progress is slower, and there is therefore a much better opportunity to observe the symptoms. Most prominent among these in the two diseases we have under consideration are feverishness; shivering; unwillingness to move; more or less loss of appetite; elevation of temperature, which may reach 106 or 107 degrees Fahrenheit; the animal is stupid and dull, and has a tendency to hide in the litter or bedding and remain covered by it. At the start bowels may be constipated or normal, but later there is usually a liquid and fetid diarrhea, abundant, exhausting and persistent to the end. Eyes at first are congested and watery, but soon the secretion thickens, becomes yellowish, accumulates in the angles and gums the lids together. Breathing is rapid; may become oppressed and labored in the latter stages. Cough may be present, single or paroxysmal. Skin is often congested and red over the abdomen, inner surface of the limbs, under surface of the neck, and on the ears. The color varies from a pinkish red to dark red or purple. An eruption is sometimes seen, which leaves crusts and scabs of various size over the skin. There is a rapid loss of flesh, the animal grows weak, stands with arched back and the abdomen drawn up, and walks with a tottering, uncertain gait. There is less and less inclination to move, and the weakness and exhaustion increases until death results.

The symptoms of swine plague in most instances are not materially different from those of hog cholera. There is, however, often extensive inflammation of the lungs in swine plague, and in that condition the breathing is more oppressed and labored, and the cough more frequent and painful. The course of these diseases varies from one or two days to two or three weeks.

Appearance After Death.—The germs of hog cholera have a habit of collecting or growing in clumps in the blood vessels, which leads to a plugging of the smaller vessels, with frequent rupture and escape of blood. This causes red spots where the blood leaves the vessels and collects in the solid tissues. In swine plague the bacteria are evenly diffused through the blood, never form plugs, and therefore hemorrhages from this cause are not seen. In the worst cases of hog cholera the changes seen in the various organs consist principally of these red spots caused by hemorrhages of greater or less extent. The spleen is generally enlarged from two to four times its normal size, is soft, and engorged with blood. In the chronic form of the disease, however, the spleen is rarely enlarged; the lymphatic glands of the affected intestine are enlarged and tough. Lung lesion may be found in the worst cases. The subacute and chronic forms of hog cholera are the most common, and the same is the case in swine plague. In this form of hog cholera the principal changes are found in the large intestines and consist of ulcers, which appear as circular, slightly projecting masses, varying in color from yellowish to black. Occasionally these ulcers are slightly depressed and uneven in outline. When cut across they are found to consist of a firm, solid growth extending nearly through the intestinal wall. In swine plague the lungs are often found to be inflamed, and to contain large numbers of small points, which may be made out by loss of color, where the life of the tissue has been destroyed. There may also be found in the lungs large cheese like masses from 1½ to 2 inches in diameter. Inflammation of the serous membrane is very common in swine plague; there also may be congestion of the mucous membrane of the large intestines, particularly of the large intestine. In hog cholera the first effect of the disease is believed to be upon the intestines, the lungs being invaded afterward. In swine plague it is just opposite. Summing up the matter we find that the most characteristic lesions in hog cholera consist in (1) ulcerations of the large intestines and (2) collapse of the lung tissue, and less frequently, broncho-pneumonia. The most characteristic lesions of swine plague are (1) inflammation of lungs; numerous small necrotic points in these organs, or a few larger cheesy masses; (2) inflammation of serous membranes with fibrinous deposits, and (3) congestion of mucous membrane of intestine, or inflammation of the same with fibrinous deposits.

In spite of this very distinct differentiation in typical cases, there are many outbreaks where it is difficult to make a diagnosis even after the post mortem examination, because both diseases may be affecting the same animal at the same time, or the changes may resemble both diseases without being very characteristic of either. In such cases only an expert, by microscopical examination and cultivation of the germs, is in position to make a reliable diagnosis.

Causes.—Both hog cholera and swine plague are caused by bacteria, which have now been so carefully studied that they may be easily identified by persons accustomed to bacteriological research. For the layman, however, this is immaterial, and we shall here only mention such causes as are evident to the eye, or which may be guarded against by the farmer once he becomes acquainted with them. Hog cholera may be produced experimentally (1) by exposing well hogs to diseased ones in the same pen; (2) by feeding the internal organs of diseased carcasses or cultures of the germs; (3) by hypodermic injections of cultures of the germs in doses of $\frac{1}{2}$ to 1 cc. or greater. Swine plague may be produced experimentally (1) by cohabitation; (2) by injecting cultures of the germs into the lung tissues. Both diseases are produced by injecting cultures of their respective germs directly into the blood vessels. From experiments it has been demonstrated that germs of the hog cholera find their way into the bodies of swine principally with the feed and drink and with the inspired air; while those of swine plague are taken in almost entirely with the air, or, at least, they almost invariably gain entrance through the lungs.

Diagnosis.—Naturally when your swine have been attacked by disease of any kind the first question that will occur to your mind is, What is the nature of the disease with which they are affected? It is important to consider briefly the evidence upon which this question may be answered. If several animals are affected with the symptoms already enumerated, and if the same disease has been affecting the hogs on neighboring farms, we may decide that one or both of the diseases in question are present since no other epizootic disease has been recognized in this country. In anthrax districts there may be occasional small outbreaks of that disease, in which there is great inflammation and swelling of the tongue, or of the throat, or simply a fever with no local swellings. If this disease is anthrax, other species of animals, horses, cattle and sheep, will also be affected. If, on examining the carcass after death, projecting, button like ulcers are found in the large intestines, we know that hog cholera is present. It must be remembered, however, that the ulcers are not found in the most acute cases, but only in the subacute or chronic form of the disease where life is prolonged a sufficient time for them to form. If there is inflammation of the lungs, and particularly if cheese like masses are found in the substances of these organs, the disease is probably swine plague. Small blood spots in the tissues or scattered over the internal organs indicate hog cholera, while inflammation of the serous membranes indicates swine plague.

Prognosis.—The losses which result from the outbreak of hog cholera and swine plague depend partly upon the condition of the hogs—that is, upon their susceptibility to the disease, and partly upon the virulence of the contagion in the particular outbreak. If the animals are very susceptible and the contagion very virulent, the loss even in large herds may reach 90 to 95 per cent, or even 100 per cent, in those cases where the disease is allowed to run its course. In milder outbreaks or with animals more capable of resisting the contagion the losses vary from 20 to 60 per cent. Toward the end of an outbreak a larger proportion of animals will recover than at the beginning. A portion of those recovering will fatten, but other animals remain lean, stunted in their growth, or never really become healthy animals.

Difference.—It will be in order here to point out a few of the more prominent symptoms, characteristic of hog cholera, swine plague and swine erysipelas (also called rouget) respectively, in order that you may be able in the great majority of cases to distinguish between them.

You will find that if the case is hog cholera that there are purple spots on the snout, eyes, mouth, skin, etc.; also that the affected hog has a tendency to vomit, its temperature being high, usually running up to 104 to 108 degrees Fahrenheit. The patient prefers lying on the side; his belly is tender; movements feeble; he grunts and shows signs of uneasiness and distress; breathing hurried and difficult; cough often present; if the disease runs on for a couple of weeks, button like ulcers appear on the large and small intestines; bowels at the outset are constipated, later bloody; at this stage offensive diarrhea is one of the symptoms.

In swine plague you will find congestion of the mucous membrane (a symptom not present in hog cholera). On snout, eyes and mouth are purple spots (same as in cholera) but ulcers rarely appear. Vomiting, as a rule, is absent, but the temperature, as in the other disease, is high in acute cases. Patient may show inclination to lie on his side, the body being rigid and stiff as in cholera, but not so pronounced. There is a hard frequent cough, with a wheezy breath. The diarrhea is either entirely absent or much less pronounced.

Lastly, in swine erysipelas, a disease unknown in this country, the mucous membrane is deeply congested, being dark red or even violet in color. The purple spots on the skin are especially prominent and extensive. Ulcers are generally absent, vomiting rare, temperature very high, running from 107 to 109 degrees Fahrenheit. As the disease progresses diarrhea ensues, the animal prefers lying on his side, is stiff and appears to be in an exhausted condition. In the latter stages the lungs may become affected with frequent coughing.

Treatment.—Can the two diseases in question be cured? This is naturally the first question you are prone to ask, and the one interesting you above all others if your swine have either of them. In this connection you should never lose sight of the fact that here as in every other sphere prevention far outweighs any amount of curing, and Davis Stock Food used regularly with the herd will prevent it. The great aim of the government and the farmers, working in unison, therefore, should be to prevent the spread of infectious diseases of all kinds. Every swine raiser should use the utmost precautions to prevent the introduction of these plagues into his herd. In spite of such preventive measures many herds will become infected. Until the Federal Government or the individual states enforce measures of eradication, it is, consequently, legitimate to ask and to answer the question as to proper medical treatment. Before formulating this treatment it should be explained that a remedy that will cure every case is not to be expected. There has never been discovered a remedy for a single one of the infectious diseases of man or animal that will cure every individual attacked. Some forms of these diseases are so violent that the animals are dead almost before they are observed to be sick. Under such conditions there is no time for the most active remedy to produce a beneficial effect. In many instances, however, the outbreak of the malady is less sudden and virulent and there is time to treat the animals after they are sick, and also the whole herd after some members of it have shown they are diseased. For a long time after beginning the investigations of the infectious diseases of the swine the head of the Bureau of Animal Industry who had them in hand was doubtful if any remedy or combination of remedies could be made which would produce any marked effect. The experiments of (1904), however, indicate that treatment, if properly applied, may be successful, and the Bureau has developed and compounded a number of formulas which may be used with good results. The most efficacious of these is given herewith:

Wood charcoal	1 pound.
Sulphur	1 pound.
Sodium chloride .....	.2 pounds.
Sodium bicarbonate .....	.2 pounds.
Sodium hyposulphite .....	.2 pounds.
Sodium sulphate .....	.1 pound.
Antimony sulphide (black antimony) .....	.1 pound.

Pulverize these ingredients completely and mix them thoroughly. In case there is profuse diarrhea the sulphate of sodium may be omitted. The dose of this mixture is 1 large tablespoonful for each 200 pounds weight of hogs to be treated, and it should be given only once daily. When hogs are affected with these diseases they should not be fed on corn alone, but soft feed should be given them at least once a day, made by mixing bran and middlings and corn meal, or ground oats and corn, or crushed wheat with hot water, stirring Davis Stock Food into this in the proper quantity, 2 tablespoonfuls to each hog. Hogs are fond of this mixture; it increases their appetite. Thus they will readily be made to take the medicine if the ration is made up as above described. Animals that are very sick and that will not come to the feed should be drenched with the medicine shaken up with water. Great care should be exercised in drenching hogs or they will be suffocated. Do not turn the hog on its back to

drench it, but pull back the cheek away from the teeth so as to form a pouch, into which the medicine may be slowly poured. It will flow from the cheek into the mouth, and when the hog finds out what it is it will stop squealing and swallow. Hogs which were so sick that they would eat nothing are often so much improved a short time after getting a dose of the remedy that they will commence to eat and keep on gaining until they appear perfectly well. The medicine for which the formula has been given may also be used as a preventive of these diseases and for this reason may with advantage be put in the feed of the whole herd. Care should, of course, be observed to see that each animal receives its proper share. In cases where it has been given a fair trial, it has apparently cured most animals that were sick and has stopped the progress of the disease in the herds. It also appears to be an excellent appetizer and stimulant of the processes of digestion and assimilation, and when it and Davis Stock Food both are used in the feed regularly you may rest assured that these important organs are properly taken care of and stimulated into healthy activity. The appetite in formerly slovenly and unthrifty hogs is vastly improved, they taking on flesh rapidly and assuming a healthy appearance. In giving out these facts to the public, Mr. D. E. Salmon, D. V. M., Chief of the Bureau of Animal Industry, indicates that, while from a scientific point of view he should prefer to conduct these experiments for another year before recommending this formula as a remedy for the diseases in question, he nevertheless, by the many urgent requests which have been made upon him for making public the formula, has let himself be persuaded to make it public without any further delay (1905). In trying it all farmers are asked to kindly cooperate with the Bureau of Animal Industry, trying the mixture when occasion calls for it and report the results to the Bureau, in order that the hog raising industry of the entire country may benefit by their experience.

Success or failure with this remedy depends largely upon the manner in which it is used. If it is improperly administered, or the hogs left out in cold storms and compelled to remain day and night in mud six inches or a foot deep, under the necessity of searching through this mud to find an ear of corn in order to get anything to eat, the farmer might as well save his money and let his hogs die, as nothing which so far has been discovered will save them under these conditions. If, however, the sick animals can be made reasonably comfortable and dry, and given soft, easily digestible feed to eat, with Davis Stock Food added to the ration, the medicine of which we have just given the formula may be used with confidence that it will give good returns for its cost and the trouble of its administration. Apparently, it is not so beneficial in swine plague as in hog cholera. In treating hogs for these diseases it must not be forgotten that in nearly all cases there is more or less inflammation of the internal organs, and particularly of the stomach and intestines. To treat such diseases successfully the animals should be kept dry and comfortable, and where drafts of air will not blow upon them. The feed must be such as can be digested by the irritated and inflamed organs, and Davis Stock Food should always be given, in order to stimulate the digestive and assimilative functions into healthy activity. With these general principles in mind the farmer may undertake to treat his sick hogs with a fair prospect of success. He may not save them all, but he should be able to save a good proportion of them.

The next question that confronts us is, what disposition should be made of the hogs during treatment, and what sanitary measures should be adopted in addition to the medical treatment? When the hogs are first found to be affected with hog cholera or swine plague the lot or pens where they are confined should be disinfected by dusting plentifully with dry, air slacked lime, or by sprinkling with a 5 per cent solution of crude carbolic acid. The animals should then all be removed to new quarters. If possible the sick and apparently well should be separated before they are removed and put into different lots. This is not essential, but is an aid to the treatment. The hogs should be kept in dry lots or pens where there is no mud, and above all, no stagnant water. It is well to keep these lots disinfected by the free use of air slaked lime or carbolic acid.

By this supplementary treatment it is not expected that the hogs will be entirely removed from the influence and attacks of germs. This is not necessary. The number of germs which gain access to their bodies may be so reduced by following this plan, however, that the vital force of the system, aided by Davis Stock Food and the medicine prescribed, is sufficient to overcome them.

In the course of this treatment the hogs will gain a marked degree of immunity. No doubt this is the result of attacks of the disease from which they recover. This recovery is in spite of continued

infection of the premises, and even though the hogs which have gone through the outbreak are apparently well and thriving, new hogs added to the herd are liable to be attacked. For this reason five or six months should be allowed to pass before any new hogs are purchased and brought on the premises, or before any are sold to be put among other lots of hogs. Young pigs, born under favorable conditions, in some cases are able to resist the infection, while in other cases they may suffer severely and die. If hogs die during the outbreak, their carcasses should be carefully burned or deeply buried, and the places where they have lain or the ground over which they have been dragged should be disinfected with carbolic acid or lime, according to the method already mentioned.

Sanitary Measures.—Use every effort to prevent the introduction of the contagion on your farm. If you purchase hogs from a distance or send your own animals out for exhibition at the fairs, see to it that they are transported in clean cars, which were properly disinfected if used for swine transport before. When you bring new hogs to the farm or when your own are returned from the exhibition, they should be rigidly quarantined and not allowed to come in contact with other hogs on the farm for at least six weeks. If you live in the neighborhood of the railroad you should not allow your hogs to run at large near the roadbed, especially if you know that swine are being transported over it. Very often infected hogs are shipped to market, and there are sufficient droppings from the cars in which they are carried to scatter the contagion along the railroad for the whole distance they travel. If the disease should occur on a farm in the neighborhood of yours you should take measures to prevent the spread of the contagion. Let no one from your household go upon the fields or into the pens where the sick animals have appeared and subsequently handle your own herd. Remember that a particle of manure or dirt the size of a mustard seed from any infected farm is sufficient to start an outbreak that will destroy a herd of swine. A particle of that size may be carried upon the shoes of a visitor, upon the foot of a dog or other animal, upon a wagon wheel, or in a multitude of other ways. No intercourse at all at such time is, therefore, the best prevention. Experience shows that hogs kept up in a pen or small lot are less subject to infection when cholera is in the neighborhood than those which are allowed to run at large in the fields. It is consequently advisable, when there is reason to fear this disease, to keep the animals in a small enclosure, which should be as dry as possible and disinfected once a week with air slaked lime or a 5 per cent solution of carbolic acid. A small quantity of carbolic acid (3 to 15 drops, according to age) in the drinking water tends to prevent infection and may have a beneficial influence upon the course of the disease.

Prevention.—Proper feeding and breeding may do much to prevent hog cholera and swine plague; in fact, if the swine are kept in a high state of health and vigor immunity in many cases is practically insured. Thus it is found that two herds may sometimes run together and be exposed to the same extent; and one of them will be nearly or entirely destroyed, while the other apparently does not suffer in the least. These facts lead to the inquiry as to whether it is possible to breed and feed hogs in such a way as to largely or entirely prevent disease; the answer at present is that, although enough experiments have not as yet been made to absolutely demonstrate this, yet it is clear that much can be accomplished in this way, and as the carrying out of the plan at the same time would increase the hardiness and thriftiness of the herd it is certainly well worthy of adoption.

The first principle of this method of prevention is to breed only from mature breeding stock which is only distantly or not at all related. The second principle is to select, if possible, animals for breeding stock which have shown, by having passed through an outbreak without becoming affected, that they possess the power of resisting hog cholera. The third principle is to feed the growing shoats upon a variety of feed which will lead to normal and harmonious development of the various organs, always taking care to keep the digestive and assimilative organs in a high state of perfection by using such an agent as Davis Stock Food with the feed. This should be done regularly, steadily, not in a slipshod way, feeding the stock food today and leaving it out tomorrow. See that the attendant who takes care of your hogs gives them the stock food as regularly as the ordinary feed ration (always mixed into the feed, 1 tablespoonful to each meal) and you will be surprised at the improvement made on your herd in a short space of time. The application of the above principles must be made by the individual breeder in accordance with his circumstances and surrounding conditions. The breeding from mature animals which are not closely related can be easily adopted by anyone. The selection of stock which

has shown that it possesses a power of resisting the disease is much more difficult, and in many cases it will be impossible for the ordinary farmer, though there are many of the larger breeders who could profitably experiment in this direction.

The diet of corn alone, upon which the hogs of so large a part of the country are raised, has done more than anything else to weaken the vital powers of the animals. With wheat selling in the markets of the country as low as corn, there is no longer any excuse for limiting the feed of hogs to a single grain. Wheat is much better than corn for growing animals, but should be crushed or rolled to give the best results. Ground oats, middlings, bran, and peas may also be used to give variety. It is hardly necessary to add that during the warm months of the year hogs should have plenty of young grass and clover.

By intelligently applying these principles in the production of the breeding stock a strain of animals may be developed which will be hardy, vigorous, prolific, and much more capable of resisting disease than the ordinary inbred and corn fed stock which is now so generally used by farmers of this country.

This treatise is prepared for your use, if you are a hog raiser anxious to learn something of the nature of the diseases to which your stock is liable, their cause, prevention and cure. In compiling the chapter on hogs we have followed the method pursued throughout the entire volume, to compile our statistics from the very best authorities in the United States and Europe, making all information given herein absolutely sound, reliable and up to date in every particular. If you will but take time to study up the subjects in which you are specially interested, be it in regard to the horse, the cow, the sheep, the hog, or any of the species of the feathered kingdom; if you will do this, and carefully and intelligently follow the teachings laid down, the losses from disease of any kind will be greatly reduced on your farm. Use Davis Stock Food regularly and follow the general treatment set forth herein, and you will be surprised and pleased with the results.

Hog Louse.

When a hog is badly affected with lice, hundreds of eggs will be found on the hair back of the ears, along the front of the shoulders, and on the flanks. The freshly deposited egg is bluish white in color, elongated, oval in shape, 1.5 mm. long, and is enlarged at the end bearing the circular operculum, or lid, which is forced open when the young louse is ready to hatch out. The egg is attached at its smaller end to the base of the hair by a gluey substance that usually completely encircles the hair. The surface of the egg is covered with small hexagonal punctuations, which give it a honeycomb appearance. The shell of the egg is perforated by numerous stomata. The egg will hatch out in about five days after being deposited, according to a somewhat antedated work on swine industry, but the Bureau of Animal Industry has modified this, and by experiments shown that the time of incubation will vary with changes in the temperature. Experiments have demonstrated that eggs freshly deposited and kept in a room of ordinary humidity at a temperature of 85 degrees Fahrenheit during the months of September hatched out in from fifteen to sixteen days, while the eggs placed in a closed dish, containing a receptacle filled with water hatched out in the course of twelve days. If you lower the temperature it retards the development of the eggs.

Injury Done by the Hog Louse.—As a rule but little attention is given by the farmers to this parasite, and it therefore seems necessary to give some little attention to the subject here. Every farmer and stock raiser is familiar with the frequency and wide distribution of the hog louse, but they do not always attribute to it any pathologic or economic importance. When a drove of hogs is not thriving properly the more common custom is to pronounce them out of condition, or simply off feed. In such cases, if a careful examination be made of the animals, the cause of the unthrifty condition of the herd is often directly traceable to the presence on the skin in large numbers of lice or other external parasites.

When the lice increase to large numbers, as they are likely to do if not destroyed, the skin of the animals becomes covered with scales and sores, and in extreme cases swelling and inflammation develop as a result of the parasites piercing the skin with their mouths hundreds of times a day in their effort to secure blood for food. The irritation thus produced is a source of constant annoyance and worry to the hogs, evidenced by their restlessness and incessant rubbing against any convenient object. The ultimate effect of such affliction is to seriously interfere with the growth and fattening of hogs, especially young pigs.

Lice not only produce a direct injury to hogs by impairment of the skin, but also, by reason of the debilitated condition of the animals which ensues, indirectly create a greater susceptibility to various

diseases. It has been demonstrated during epidemics of hog cholera that animals affected with lice are most susceptible to the disease, and that the percentage of fatalities is greater than among herds free from lice. An authority upon the hog and its diseases has therefore recommended as the first treatment for hog cholera the destruction of the lice on the animals and disinfection of the pens. The opinion that hog lice may carry the infection of hog cholera from sick to healthy animals is not without support among some writers on the diseases of hogs. No positive evidence or experiments has been brought forth, however, and the possibility of hog lice conveying the disease is an open question. The destruction of the parasite is a comparatively easy matter, and practical tests have demonstrated the economic importance of freeing hogs from pests that deter growth, weaken the general physical condition, and render the animals easy prey to contagious maladies.

Treatment.—In the treatment for hog lice preventive measures as well as destructive remedies must be applied. The sleeping quarters of lousy hogs become infested with lice, which crawl off the hogs and secrete themselves in the crevices of the building and in the bedding, while the eggs on the hair that the hogs shed and rub off will hatch out young lice. These parasites in the building immediately reinfest animals from which the lice have been removed by treatment. The selling and slaughtering of the majority of hogs at a comparatively early age, and the consequent destruction of lice on them in the scalding vat, is naturally a great check to the increase in the number of the parasites. As a usual thing, however, an entire herd of hogs is not sold at one time, and the few remaining animals will serve as hosts for the lice in the building until a new drove of hogs is replaced in the same pens, when the lice at once begin to multiply rapidly on their new hosts. A thorough treatment, therefore, includes the destruction of lice in buildings and pens in addition to the treatment of the animals themselves. If the pens where lousy animals have been kept are left vacant for a period of two weeks all lice will have perished, and any new animals introduced will be in no danger of infection.

For disinfection of buildings a 3 per cent solution of any of the coal tar preparations, to be applied with a broom or spray pump, is recommended.

In experiments made with kerosene emulsion and Texas oil it was demonstrated that the kerosene emulsion—the lice being plunged into it—killed them instantly, while the Texas oil acted more slowly. The hogs in the experiment which was made by the Bureau of Animal Industry were sprayed twice, two weeks intervening between the two treatments. Kerosene in a 10 per cent solution proved successful. Phenalin in a 3 per cent solution also destroyed the lice. The Texas oil in a 10 per cent emulsion was found to be absolutely useless. Later experiments with Texas oil in its crude state have demonstrated its value as a dip for hogs affected with lice and the itch mite. Fifty-two gallons of oil were placed in a tank with 60 gallons of water and the pigs dipped once. A few days after dipping the lice were found to have disappeared, and the scab mites with which the animals were severely affected were also destroyed.

The foregoing account of results of experiments with different remedies used against the hog louse shows that the following are successful, cheap, easily prepared, and readily applied: Kerosene emulsion, kerosene and water, kerosene (pure, but to be used with caution), Beaumont oil, and benzine emulsion (not much used). The lime and sulphur dip recommended as a cure for scabies in cattle and hogs was tried as a remedy for lice on hogs but has not as yet been sufficiently tested for a statement of results at this time.

Formulas of Oil Emulsions.—(1). Kerosene emulsion is prepared according to the proportions in the following formulas:

- (a). Hard soap, $\frac{1}{2}$ pound (one-half bar common soap).
Kerosene, 2 gallons.
Water, 1 gallon.

Boil the water and soap until the latter is dissolved, remove from the fire, then add kerosene and churn or agitate vigorously till an emulsion is formed. This emulsion if thoroughly mixed will form a gelatinous mass on cooling; it keeps indefinitely and may be used at any time by diluting with warm water to 20 gallons. If used after cooling, the mixture should be heated again (great care must be

used in heating the second time because of the inflammable kerosene present, and for safety the mixture should be heated out of doors) and then thoroughly mixed a second time.

- (b). Soft soap, 1 quart.
Hard soap, $\frac{1}{4}$ pound.
Water, 2 quarts.

Mix as in preceding formula and dilute with 1 gallon of warm water. Reheat as in formula (a).

- (c). Sour milk, 4 gallons.
Kerosene, 2 gallons.
Mix the milk and kerosene and dilute with warm water to 20 gallons.

This formula has the advantage over other methods of making kerosene emulsions, as it avoids the necessity of making a soap mixture, the milk acting as an emulsifier.

- (d). Hard soap, $\frac{1}{2}$ pound.
Pyrethrum, $3\frac{1}{2}$ pounds.
Kerosene, 2 gallons.
Water, 1 gallon.

Boil the water and soap until the latter is dissolved. Extract the pyrethrum with the kerosene by stirring the pyrethrum and kerosene together and allowing the mixture to stand for twenty-four hours, then pour off the liquid. The kerosene extract is then mixed with the soap solution, as in formula (a). For use dilute with warm water to 20 gallons. Reheat as in formula (a).

The pyrethrum is said to add to the effectiveness of the emulsion. The kerosene emulsion when prepared should not have oil drops rising to the surface. If drops of oil are seen it is proof that the emulsion has not been sufficiently churned or agitated to emulsify the mixture. Golf, an authority upon the subject, recommends a spraying pump for mixing kerosene and water, which mixture is said to be more penetrative than an emulsion. This pump is fitted with a foot valve admitting oil and water through separate orifices, and a graduated screw regulating the proportionate amount of each fluid admitted. The packings and pistons should be made of leather and the valve seats of brass, on account of the destructiveness of the action of the liquid on fittings made of other materials.

- (2). Benzine emulsion:
Soft soap, 4 parts.
Water, 10 to 15 parts.
Benzine, 1 part.

Boil the water and soap until the latter is dissolved, remove from the fire, then add the benzine and agitate till an emulsion is formed.

Mange, or Scabies of Hogs. Mange in hogs, which is a disease of the skin caused by parasitic mites, is of two kinds. The so called demodecic form is produced by a mite named *Demodex folliculorum* var. *suis*. The sarcoptic form, which is better known and considered to be more common than demodecic mange, is caused by a mite known as *Sarcoptes scabiei* var. *suis*. These two parasites of mange in hogs are designated as variety *suis* in order to distinguish them from varieties of the same species which cause mange in the dog, the cat and sheep and some other animals.

Sarcoptic Mange. The parasite belonging to this form of mange is the largest of its species and can readily be seen with the aid of a pocket lens. It is small, white, globular in shape, with the body transversely striated. In front is a prominent mobile rostrum. On the dorsal surface of the body are numerous three-cornered scales, also six thoracic and fourteen abdominal spines. The first and second pair of legs in the female bear a pedicellate sucker. The third and fourth pair end in a long spine. The first, second and fourth pair of legs in the male bear a pedicellate sucker, while the third pair end in a long spine. The female is nearly $\frac{1}{2}$ millimeter long and about $\frac{1}{3}$ millimeter broad. The male is a little smaller than the female.

Symptoms.—The skin at the start is inflamed and irritated about the eyes and ears; the pruritus gradually spreads over the withers, flanks and inner surface of the body. The skin becomes wrinkled, is covered with crusts that take on a bluish gray luster, and the bristles either fall out or become matted

with the crusts that are continually forming and dropping off. Beneath the crusts the skin is raw and cracked, the excoriation finally becoming so severe that bleeding occurs when the crusts are pulled off. Conclusive diagnosis of sarcoptic or demodetic mange is obtained by finding the parasites. It is necessary to pull off the crusts and scrape the skin to the quick, and then examine the scrapings with a hand lens.

Contagion.—The disease is distributed only through contagion, either by diseased animals or by means of the buildings and pens where diseased hogs have been kept. It gradually spreads throughout a herd. An infested sow will transfer the disease in a severe form to her young before they are three weeks old. Scabies of the pig has been transferred to the dog, and is said to be transmissible to the horse. Numerous instances are recorded of man contracting the disease through contact with many hogs.

Injury.—On account of its destructiveness to the skin and the restlessness produced in the animals infested, sarcoptic mange is a very serious disease, that increases in severity, and not only prevents proper fattening and growth of the hogs, but will finally cause the death of young pigs. It is, too, a more common disease than is generally believed.

Treatment.—The instructions usually given for treating scabies, or mange, of the hogs, direct that the animals must be thoroughly cleansed and scrubbed with soap and water or some strong alkali solution before the remedy is applied. Such care and detail are possible where only a few hogs are to be treated, but where herds numbering from 50 to 500 are to be treated such time consuming and expensive operations are out of the question. Dipping the animals is the only practical method of applying remedies to large herds. Mange is at its best a hard disease to combat, especially in hogs, because of their unclean habits and usually filthy quarters. When mange is discovered, the hogs should be shut away from mud wallows a day or so before treatment, in order that the dirt and crusts may be rubbed off the skin.

It is not very difficult to control the hog in a properly constructed dipping vat, and an animal may be kept in the dip as long as desirable, while the liquid is being rubbed into the skin with a brush or broom. Care must be taken to wet the inside of the ears thoroughly by rubbing them with the hands. If the hogs are simply driven through the dip without any scrubbing it will require a long time to eradicate the disease. After the hogs have been dipped they should be kept away from mud wallows and dusty pens for a day in order that the dip may not be absorbed by dust and mud coming in contact with the wet skin. A time should be chosen for dipping when there has been no recent rain to make it possible for hogs to become covered with mud crusts. Never dip in cold weather. If only a few hogs in a herd show symptoms of scabies it is not sufficient to dip only those few that are badly infested, for other animals in the herd are sure to harbor some of the parasites, which will continue to spread the infection. A single dipping is not sufficient for a cure, for some of the parasites will escape destruction by the first dipping, and more young mites will hatch from recently deposited eggs. A second dipping, therefore, should follow six days after the first treatment. The incubation period of the eggs under favorable circumstances is said to be from three to five days. Perseverance is the only way to effect a permanent cure. The improved condition of scabby hogs, even on the day following a successful treatment, will be evident from their usual quietness and better humor.

There are numerous mixtures and compounds that kill the scab mites, but the item of expense and the facility of preparation and application restrict a choice of remedies. Liquid remedies are the only practical ones to be used on a large scale; if ointments are used it is necessary to scrub the animals thoroughly before they are applied.

Ointments.—(1.) Helmerich's pomade (sublimed sulphur, 2 parts; potassium carbonate, 1 part; lard, 8 parts).

(2.) Creosote, 1 part; lard, 25 parts.

(3.) Sulphur, 10 parts; lard, 30 parts.

(4.) Turpentine, 8 parts; flowers of sulphur, 1 part.

Liquids.—Beaumont, or Texas, oil. Place 52 gallons of oil in a tank containing 60 gallons of water, and dip the pigs once.

One part of creosote mixed with thirty parts of linseed oil is a remedy much used in Germany.

A hog raiser in Nebraska recently observed that a number of swine in his herd were in poor condition, covered with grayish scales. Examination revealed sarcoptic infection in a severe form. The animals without any previous washing or preparation were dipped in the Beaumont oil. They were driven into the dip and scrubbed with an old broom. Special care was taken to rub the inside of the ears with the hands, since the skin on those parts was raw and cracked and harbored scores of the parasites. The day following this treatment the animals were more quiet and ate their feed better. This improvement was particularly noticeable in the young pigs. One month after the treatment the owner wrote to a friend: "As to the condition of the hogs, they are much better since the treatment; some seem to be entirely cured of that scaly look. I would recommend the Texas oil as a good thing for scabby hogs." Failure to dip a second time according to instructions, accounts for the lack of complete success in this experiment.

Demodexic Mange.

On account of its resemblance to a laurel leaf the Demodex in pigs has been scientifically named Demodex phylloides. Government inspectors have frequently withheld hogs from the market because of a peculiar appearance of the skin which was shown to have been caused by Demodex. Leather manufacturers state that a large percentage of beef hides received are partially ruined by the pitted condition of the skin, a condition which is produced by this parasite found on the cattle. It is generally held that Demodex does not produce any detrimental effects in the way of retarding the growth or fattening of the pig. In cattle the only complaint seems to come from the leather manufacturer.

Application of Remedies.

In applying liquid insecticides to hogs, spraying and dipping are the two methods generally used. Where there are only a few animals, the remedy can easily be applied with a brush or broom, but in a large herd a more rapid method of application is necessary.

Dipping is obviously the most thorough method, but more expensive on account of the labor and material necessary to construct a dipping vat, unless a large number are to be treated. A dipping vat may be constructed in accordance with the following method, the price of which will be about \$25.00:

12 feet 4x6-inch white pine or tank lumber.

64 feet 4x4-inch.

16 feet 2x6-inch.

16 feet 2x4-inch.

24 feet 3x4-inch.

For the approaches on the dripping platform:

10 feet 2x12-inch tank lumber.

100 feet 4x4-inch yellow pine.

60 feet 2x6-inch.

114 feet 2x4-inch.

162 feet fencing.

17 pounds 20-penny nails.

7 pounds 10-penny nails.

10 square feet of zinc.

4 T hinges, 8-inch.

The zinc is used to cover the incline leading to the vat, in order that the smooth surface afforded will prevent the animals from halting after once starting for the plunge. The zinc covering is, of course, not a necessity, but it is very convenient. The vat is placed in an excavation in the ground, and should project about 6 inches above the surface of the ground, in order to prevent dirt and trash from falling into the dip. Most farmers and stock raisers usually have a quantity of unused lumber lying about that may be utilized in the construction of a dipping plant, thus diminishing the actual cost of construction. A canvas curtain hung at the entrance to the slide will facilitate driving the hogs. The dripping platform, constructed of tongued and grooved lumber, slants toward the vat, and is

bordered with narrow strips along the sides in order to direct the liquid back into the vat. The dipping vat should be placed in close proximity to the pens, and where a stationary chute is not built, movable panels of fence will make the transferring of the hogs an easy matter.

In 1892 the Oklahoma Experiment Station constructed a galvanized iron 22-gauge vat, in which $\frac{1}{2}$ -inch gas pipe was used as a framework. The entire cost of such a vat, with inclined entrance and exit, is between \$25.00 and \$30.00.

There are a number of dipping tanks offered on the market, any one of which will give satisfactory results. Galvanized and cast iron tanks of various sizes cost from \$10.00 to \$20.00.

A simply constructed portable dipping vat is used by the Bureau of Animal Industry, for experiments in treating lousy and scabby hogs, with very satisfactory results. It is well suited for dipping moderate sized herds of hogs and is also inexpensive. No dripping platform was used in the experiments conducted by the Bureau, but this caused a considerable quantity of liquid to be wasted. Where there are more than 40 or 50 hogs to be dipped it is necessary to provide a dripping platform or else replenish the liquid. The following materials were used for constructing this vat:

Two 1x12-inch 14-foot hard pine.

One 2x12-inch 24-foot hard pine.

Three 2x4-inch 12-foot hard pine.

One 1x6-inch 15-foot hard pine.

One 2x6-inch 12-foot hard pine.

Two pounds 20-penny nails.

Two pounds 10-penny nails.

The 2-inch planks are used for the bottom and ends of the tank, the 1-inch boards for the sides, and the 2x4 sticks for braces. When matched lumber is not available, the boards are joined at the edges as perfectly as possible, the cracks smeared with pitch, and calked. The boards for the sides of the tank are cut 6 feet $6\frac{3}{4}$ inches long, clamped together (after the edges have been smeared with pitch and dowel pins adjusted), and the proper braces (2 feet $7\frac{5}{8}$ inches long) nailed on each end $\frac{1}{2}$ inch from the end, with the braces projecting below the lower edge of the side. The middle brace is now nailed on in the position relative to the notch in the bottom made to receive it. The end boards are similarly joined and held together by temporary braces tacked on the outer side. The two boards for the bottom are joined, and the braces, cut just long enough to extend between the inner margins of the notches made to receive the side braces, are nailed in place. The sides are then set in the grooves in the bottom (using pitch in the joint), forced firmly into position, and the side braces nailed to the bottom and to the ends of the braces on the bottom. The ends are next firmly fitted in the grooves in the bottom, nailed from the under side with 20-penny nails, and then nailed to the sides and side braces. The braces across the top are then nailed on.

Three pieces of 2x6 inch plank $2\frac{3}{4}$ feet long, held together by cleats nailed across them serve as a ladder for the pigs to crawl out on. The upper end is movable so that it may be raised from position in order to keep the pigs in the dip as long as desired. The lower end of the ladder is supported 6 inches above the floor of the tank and is anchored down with a cord tied to a staple driven into the bottom of the tank. The upper end rests on the brace across the top and is held from slipping down by means of a cleat nailed on the under side. The inside measurements of the vat when completed are 6 feet 6 inches long, 1 foot 8 inches wide, 2 feet 5 inches deep, and holds $6\frac{3}{4}$ gallons of fluid to an inch of depth. Twenty inches of fluid is sufficient to cover a 300-pound hog. When using this vat it is of course necessary to increase the height of the side by a temporary construction and to construct a chute leading to the vat. The vat should be sunk into the ground a depth of 2 feet, thus saving the trouble of having to force the pigs up an inclined plane. It is most convenient to place the vat in front of the door to a hog house, sink it into the ground till the top is level with or a little below the floor of the house, and then build a barricade from the door along the sides of the vat.

Spraying.—When the necessary apparatus is provided, dipping the hogs is the most convenient and rapid method of applying insecticides. Experiments, however, have proved that spraying liquids over animals is equally effective if thoroughly performed. A force pump is fitted with a hose of sufficient

length to permit freedom of motion to the operator. A spray nozzle is attached to the end of the hose, or, as has been done in the absence of a suitable nozzle, the end of the hose is simply compressed between the thumb and forefinger, making a fan like spray that can be readily directed in any quarter. Any outfit for spraying trees is likely to contain nozzles that can be adapted to spraying liquids over animals. For those who do not possess a spraying apparatus, and do not care to purchase the more expensive outfits, one of the cheaper pumps put out by firms handling such goods will serve the purpose very well.

There should be considerable force to the jet of fluid, and the spray must not be too finely divided, otherwise the liquid will not penetrate between the hair and thoroughly wet the skin, as it must do to be effective.

The following method of applying kerosene to hogs is as simple as it is effective: A 6x6-inch oak post is set firmly into the ground. A 2-inch hole is bored 12 inches into the top of the post. A 1¼-inch hole is bored from each side of the post to open into the bottom of the larger hole. Soft pine plugs are driven into the small holes and burlap or old cloth is wrapped around the post, covering the pine plugs, and bound down with wire. The hole in the top of the post is then filled with kerosene. In a short time the rags become saturated with kerosene percolating through the pine plugs. Two quarts of oil daily are required the first three or four days and afterward one quart a week. A hog raiser who had erected such a device, jokingly remarked, in response to an inquiry as to its utility, that every hog wanted to be first at the post, and that the lice in the herd soon disappeared. A platform should be built around the post in order that the hogs will not dig a mud wallow about its base. Another hog grower devised a wholesale method of ridding hogs of lice by digging a basin or wallow in the yard, pouring in water and throwing in a small quantity of kerosene. He states that the pigs frequented this place and the lice soon disappeared.

Acute Gastric Indigestion.

This affection is often met with in hogs, and its general cause is improper feeding; making up the ration of such feedstuffs as swill, sour potatoes, half decayed or otherwise spoiled turnips, apples, frozen feed, too large a quantity of succulent vegetables, and the mixing of alkaline powders, such as have been used for dish washing, etc., with the swill (do not feed the dish water to the hogs). Other causes are the swallowing of indigestible matters, such as hoof, horn, hair, bristles, bark. If such are partaken of and the system is not relieved of them by vomiting, gastritis and indigestion may ensue. Again, medicinal agents of a poisonous nature, as, for instance, paint and lead, may produce the affection.

Symptoms.—Dullness; arching of the back; erection of the bristles; hog may be seen standing with the feet brought together; hiding under the bedding; uneasiness; grunting; restlessness; the belly is tense and enlarged. Diarrhea with subsequent recovery may follow these symptoms, or the vomiting up of the matters which have produced the disease may bring relief.

Treatment.—Give a full emetic, such as 1 ounce of Glauber salts. As antidote for alkaline poisoning give vinegar, followed by a laxative. In order to insure good health and vigor in your hogs keep their digestive and assimilative functions in good working order by always adding 1 tablespoonful of Davis Stock Food to each feed. If the hog until you started doing this had been backward, unthrifty and slow to grow and lay on flesh you will find a surprising change take place shortly after you commence using the stock food, and you will admit that it is worth its price over and over.

Catarrhal Gastritis

consists in an inflammation of the gastric mucosa, or the gland from which the gastric juice is secreted. It is accompanied with a mucopurulent discharge.

Causes.—All kinds of feed that are in a state of decomposition; fermenting swills; an excessive quantity of brine; washings from tables, dishes, etc.; dish water; irritants of all kinds; also parasites of the gastric organs.

Symptoms.—Restlessness; colicky pains; costiveness or diarrhea; vomiting; stiffness; feverishness; grunting; arched back; tail is usually limp and lifeless, the belly tender and tense, and the hog moves about uneasily as if in pain. The condition may be relieved by a sudden attack of vomiting, followed by recovery.

Treatment.—You should at once change the diet of the hog or hogs affected. Give them, for instance, for a change, freshly cooked roots, buttermilk, boiled milk, linseed meal, etc., always adding

Davis Stock Food, 1 teaspoonful to each feed, to the ration. This will soon correct the condition. Remember that the stock food may be given both in health and disease with equal benefit. No hog raiser should be without it. As an emetic, in cases of catarrhal gastritis, 30 grains of ipecacuanha is recommended. If the animal is constipated you may relieve it by a dose of calomel or jalap. If there is a violent diarrhea give small doses of gray powder, and to relieve the attendant irritation of the gastric mucous membrane you may administer a small quantity of bismuth subnitrate. Thoroughly cleanse and disinfect the pens with Phenalin, change the litter frequently and allow a generous supply of fresh straw for bedding. Do not let manure accumulate in the pen.

Fever.

We are accustomed to divide swine fever into two forms, known as the fatal, and the subacute or slowly progressive. They are of marked differentiation, and it is quite easy to tell the one from the other, if the respective symptoms are known.

Symptoms.—The usual symptoms attendant upon diseases accompanied by high fever are present in the acute or fatal form of swine fever. There is a loss of appetite; exhaustion; prostration; dullness and listlessness; animal is inclined to lie down or hide under the litter; sensitiveness to cold; skin is hot and feverish; eyes partially closed; patient is in evident pain and distress. Three or four hours after the first signs of the disease become manifest, the hog becomes worse; on the parts of the body where the hair is absent you may observe a scarlet blush (looking for it, for instance, on the inside of the thighs, across the abdomen or belly, on the point of the axilla, etc.). The feces are thin and have a peculiarly offensive odor, this following upon the costiveness present at the onset of the disease. The patient often succumbs three or four days after the onset of the affection. This disease is a common one among swine, and is very infectious. An entire herd may be attacked once it is introduced and it is hard to check its course, this being more especially so when young pigs are the victims.

In the other form of the malady, called the subacute, there is a gradual progress of the disease. It is hard to diagnose and it is only an examination after death which enables the skilled veterinarian to absolutely satisfy himself that it really is a case of the disease in question. There is, however, no reddening of the skin; the animal is slow, unthrifty, grows but little, may suffer from almost constant diarrhea, and this should enable the experienced hog raiser not alone to differentiate between the acute and subacute forms of the malady, but also to satisfy himself with reasonable certainty that the animal suffers from the disease in question. The rule is that swine fever tends to assume this subacute and slowly progressive form after the animal has reached a certain age making it better able to resist disease of any kind. The age of eight or ten months or over generally favors their recovery.

Causes.—Swine fever is caused by a bacillus, presumably taken into the digestive organs with the feed and there allowed to develop.

Symptoms.—Typhoid fever in the human and swine fever have much in common. The latter as well as the former is a disease of the digestive organs, and its foremost symptom consists in changes well defined, occurring on the surface of the mucous membrane in the alimentary canal. There is a formation of ulcers, single or grouped together, covering some part of the intestinal tract. These ulcers are of a yellowish gray, or dark gray shading into black color, generally round, size and shape varying. You may discover these ulcers on the tongue, stomach, small intestines or the epiglottis; still more often in the colon and large intestines. The lesions may cover the whole thickness of the mucous membrane, but they are rarely found to take in the other layers or coats of the organs. The peritoneal covering of the intestine is seldom penetrated by these ulcers, even in cases of long standing. In the fatal cases of the disease the small intestines become more generally affected. In the other form an examination after death often reveals the lesions in the large intestines so abundant and thick that it is to be wondered at that the opening in the organs allowing of the passage of the feed and feces has not long since become closed and the patient died of acute constipation or congestion. On the other hand, it is a fact that in the case of very young pigs, in which death had followed shortly upon infection, there is often an entire absence of the ulcers mentioned, inflammation of the stomach and bowels being the only symptoms present. Even in adult pigs, dying in the first stages of the malady, it is often found that no visible ulcers or lesions have developed.

Associated with swine fever is sometimes found a disease of the heart called Verrucous Endocarditis. It is, however, not produced by swine fever, and various experiments made for the purpose of determining as to whether this affection is communicable from one hog to another led to the conclusion that it is noninfectious, at least none of the attempts to inoculate healthy pigs with the blood taken from the heart of those affected with verrucous endocarditis, or with cultures of the bacilli, developed from the blood taken from the heart of the diseased animals, have ever been attended with the least success. At times also pneumonia with or without pleurisy, occurring simultaneously with swine fever has caused the theory to be advanced that lung complications were part of the symptoms attributable to this fever; but experiments made to demonstrate if this was in reality the case answered the question in the negative. It is, however, a fact that animals suffering from swine fever are extremely liable to contract pneumonia and pleurisy, and this is ascribed to the lowered vitality and diminished resistance of the hogs, attendant upon the fever.

No treatment except the preventive methods advocated in all instances of acute or chronic diseases, such as proper feeding, hygiene and sanitation, cultivating a high degree of health and strength in your herd by always keeping the digestive and assimilative functions up to the standard, can be recommended for swine fever. Always have Davis Stock Food at hand, and feed it regularly in each feed (1 tablespoonful to each feed), and you will find your herd growing strong and hardy, each individual member acquiring a constitution that will increase his resistance against disease 50 per cent or more.

General Catarrhal Stomatitis. This rather common disease of the swine is principally caused by irritation in the intestines and stomach, produced by, for instance, feed that is too hot; also feed that is hard and fibrous, or feed containing irritating substances, such as spikes and awns of a size permitting them to enter sores or gland duct, or adhering to mucous membranes; also, all kinds of putrid, decaying, fermenting feed or medical agents of an irritating character may induce the disease. Forcing the jaws of the hog apart with a piece of wood, or catching and holding the animal by making a running noose on a piece of rope and fastening it around the upper jaw, are also often responsible. Again, inflammation of the mucous membranes, erosion, eruption, etc., may be responsible. Bad, decaying teeth may react upon the secretive glands and produce it.

Symptoms.—Loss of appetite; refusal to eat, or dainty eating, in place of the usual voracious appetite of the hog; preference to soft, liquid feeds; champing of the jaws; hankering after cold water; a disposition to swallow hard materials half chewed; frothing around the lips; mouth dry, hot and red, emitting an offensive odor, are symptoms.

Treatment.—Soothing and cooling lotions; astringents in the form of antiseptic lotions, vinegar and honey, a dose of tincture of myrrh once a day or oftener if the mucus is spongy and eroded. The feeding of soft feeds, such as pulped roots, gruels, etc., adding 1 tablespoonful of Davis Stock Food to each feed; plenty of cool, clean drinking water, which should at all times be within reach. Also, in case of indigestion or constipation, administer a laxative, followed by soft succulent feed containing 1 tablespoonful of Davis Stock Food.

Ulcerative Stomatitis. Various causes, such as insufficient feed of an irritant character; confining of the hogs to close, damp, badly ventilated pens, an exhausted physical condition attendant upon wasting, debilitating diseases, have been mentioned as responsible for this affection in the swine. Ulcerative inflammation may result as an outcome of the spots of congestion and petechiae developing on the buccal mucous membrane. It seems, however, that these conditions are complicated with bacteria introduced into the mouth and digestive organs by the feed and water partaken of.

Symptoms.—Fomentation of froth around the lips; gnashing and grinding of the teeth; loss of appetite; offensive breath; champing of the jaws; tongue and gums are deep red in color; the mouth is full of vesicles or white patches, which in falling off leave red angry sores in their place; deep, putrid, offensive ulcers with nasty odor to the salivation and breathing, may result from these. There is a tendency to increased dullness and exhaustion as the disease progresses, and the loss of flesh, debility and emaciation become more and more marked. If the case be a severe one it may later on be complicated

with infective pharyngitis or enteritis, indicated by virulent matters from the mouth, tenderness, redness and swelling of the throat; also colicky pains, offensive dark colored diarrhea, often followed by death.

Treatment.—First of all you should without delay separate the diseased members of the herd from the healthy ones. Next thoroughly disinfect the pens, including all troughs, and other articles with which the affected animal or animals have come in contact. Phenalin and ordinary slaked lime are excellent disinfectants for this purpose. Then employ local antiseptics. In the milder cases a local wash with Phenalin once or twice daily may be all that is required. Sulphuric acid or hydrochloric acid, diluted in fifty times their volume of water, may be applied in more severe cases; tincture of iron, chlorate of potash, or chloride of ammonia, or borax, are also good. Keep the patient's digestion and circulation in order by always adding 1 tablespoonful of Davis Stock Food to each feed, and if the case is not too far advanced, the chances are that a change for the better will shortly ensue, and complete recovery result. The stock food should also be fed to the healthy members of the herd, in order to increase their strength, vitality and powers of resistance against disease in any form. As a preventive against disease in any form, and as an agent par excellence for putting the stock into superb condition, pleasing to the eye and of the highest value in the markets, it pays for itself over and over again. This cannot be too oft repeated.

This is a disease often met with in this country, and consists in a worm lodged in the fat environment of the kidneys of hogs. It is often supposed by stock breeders to cause certain forms of paralysis of the hind limbs. In scientific language this worm is known as *Sclerostoma pinguicola*, and it should not be confused in the lay mind with the other kidney worm, *Dioctophyme viscerale*, common to dogs and man. It is true, however, that both worms belong properly to the same zoological family (*Strongylida*), but the genera and subfamilies differentiate materially. Thus, while the kidney worm of the hog only attains a length of 2 inches in the highest, the kidney worm in the dog may grow to a length of from 1 to 3 feet. The body of the hog worm is plump, mottled in color, white, yellow or black, according to the organs visible beneath it. Length of the female averages 37 mm., the male, 32 mm. Worms usually are found in pairs in cysts or canals in the organ, the connective tissue layers between the fat being the usual seat of infection, and the cysts of parasites may there be found in great numbers and closely packed together. Notwithstanding the fact that as a rule a cyst is found to contain only two worms, a male and a female, occasionally three may be found lodged together, two females and one male or just as often one female and two males. In the cyst is contained pus in which the parasites swim or are bathed, and in this pus thousands of eggs in the segmentation stage are enveloped. Occasionally such cysts in the kidneys are found empty, as if their occupants had left them. It is not demonstrated with any degree of satisfaction how the eggs leave the cyst in the kidney fat, or enter the bodies of fresh hogs, but it is presumed that they in the fullness of time, having developed to a certain extent, find their way out of the body with the urine. One authority thus reports having found the eggs of the worm in the urine. Thereafter the embryos are supposed to develop for a limited time in water around the pens and yards, shedding several skins in the process, ultimately to again gain access to the body of the hog, being contained either in the drinking water or feed.

Treatment.—On account of the filthy and unclean habits of the swine, encouraged in many instances by the owner instead of being constricted as they ought to be, it is not easy to advocate any practical measures fit for being adopted to prevent the occurrence of this troublesome worm. If you feed from troughs exclusively and supply your hogs with plenty of pure drinking water you may to a certain extent decrease the liability to the affection, but will not have entirely excluded it from your pens. An excellent old German authority upon the breeding and feeding of hogs, gave it as his advice to his countrymen that swine should be kept in a less swine like manner, and this maxim may well be adopted by the hog raiser here as elsewhere.

“Keep your swine in a less swine like manner,” is a maxim which you will do well to adopt as the first principle to be applied in the hog raising industry. It will pay you well. Cleanliness, hygiene and sanitation, observed both in the manner of feeding, the feed supplied, and the quarters in which

the herd is confined are all essentials if the largest possible success is to be achieved in this important branch of activity in the world of stock breeding. Remember that in the care of the hog, cleanliness, as in all other departments of life, must be internal as well as external. A physical body to be clean and sweet and healthy, should not alone be kept free from dirt and filth on the surface, but, most important of all, the organic functions, the uninterrupted and healthy activity of each and every organ, should be carefully regulated. The secretive glands, the functions of digestion and assimilation, the action of the liver and kidneys, and so on throughout the whole intricate and wonderful mechanism, should all be made to act harmoniously and healthily together; and if this be attained, the cleanliness of the surface of the body will to a large extent take care of itself, the healthy active pores which in millions of numbers cover the skin, will go on excreting all the impurities of the system, and all we have to do is to apply water and soap and wash it off from the skin. But if, on the other hand, the system is clogged up from disease, the organs acting sluggishly and spasmodically without unison and harmony, you may rest assured that a chronic state of uncleanness will go hand in hand with it on the surface. It is almost impossible to wash a diseased, congested body clean, and the reason for this is that the pores in the skin are inactive, clogged up and congested with the rest of the organs. And here is where the great and lasting good accomplished by Davis Stock Food becomes most apparent. Liberating the juices of the mouth and stomach, acting thus directly upon the digestive system, correcting and curing all tendencies to constipation or other diseases of the alimentary organs, perfecting the assimilative powers, and this again reacting upon the circulation of the blood, causing it to flow freely and unobstructedly through the veins to every part of the system, enriching it in quality and substance, it will in the course of a short time make a clean thrifty animal of one that before was unthrifty, untidy and backward. There is no secret about how it is done either. The process is simple and natural and admits of universal application, both as regards the swine and all other domestic animals. It will give you a clean animal inside and out, and if you place that regenerated animal in clean, sanitary surroundings, feeding it properly, continuing to allow Davis Stock Food with the regular ration, you can increase the value of your entire stock 50 per cent in the course of a year or two.



PRACTICAL FARM BUILDINGS.

(From U. S. Dept. of Agriculture.)

Introductory. There is no more important undertaking on the farm than the building of the house which is to be at once the owner's residence, his office, and in every sense of the word his home. But notwithstanding this fact there is no undertaking which, sometimes as a result of entirely unavoidable circumstances, more often from other causes, receives so little forethought, so little careful consideration, and so little skilful planning and workmanship.

Too often the farmer finds himself compelled to provide a residence for himself and his family on short notice and on a short bank account. The result is an inconvenient, poorly constructed house, and frequently, in the end, money wasted. Many facts and ideas which the farmer has stored away in his mind for such an emergency are crowded out or lost sight of in the press for time. Frequently the nearest village carpenter has to be entrusted with many important details and the result is far from satisfactory.

It is with the hope of being of service to all who have to build a farm home that this bulletin is written, but particularly is it aimed to help those who have neither the time nor the funds to build as they would like to, and who must therefore begin in a very modest way. To that end some very trite statements are made, some very simple facts stated—facts that everybody knows, but which many are apt to forget at the very time when their remembrance would prove useful.

Designing a House Capable of Enlargement.—By carefully designing a house so as to facilitate its subsequent enlargement, money may be saved and its convenience increased. Additions costing \$400.00 might have been so provided for in the original scheme as to have permitted their erection for \$350.00, and so on. Poorly lighted and inconvenient rooms and passages, inaccessible chimneys, steep or dark stairways, etc., are all likely to prove obstacles in building additions to houses where the original plans did not take into consideration the probability of such additions.

Comfort, Convenience, and Economy.—Practically speaking, three essentials should be combined in every farm home; they are comfort, convenience, and economy. It is hardly necessary to enlarge upon comfort as an essential in every home, and particularly in the farm home. The farmer, whose duties are always exacting, and which usually expose him to all the discomforts of all kinds of weather, needs and deserves a home where, during the hours of rest and recreation, he can enjoy comfort to the fullest extent. In the matter of convenience his wife is, perhaps, more to be thought of. Her duties are always numerous and her work never done. Anything that can save her steps or lighten her burden is well worth the effort. Unfortunately there are few farmers who are not obliged to give the closest study to the matter of economy, and there is certainly no greater saving to be accomplished than that which results from carefully prepared plans and the use of proper and durable materials.

Necessity of Perfecting Title to Land.—It may seem trite to urge the necessity of making sure of the title to land before building on it, and yet the records of our law courts demonstrate, every week in the year, that hundreds of people neglect this to their sorrow.

Land, and particularly farm land, is often held for years without a question as to its ownership, and then its increased value prompts someone to dispute the title. Frequently such suits are the work of shyster lawyers, whose work on the county archives has revealed to them some flaw in the holder's title or a seemingly or really reasonable claim to the land held by some other person.

An offer of their services to prosecute such a claim, their remuneration to be contingent on their success, is generally accepted, and the holder, who is usually the equitable owner, is put to endless expense and worry to defend his title to his and his children's home.

A few dollars paid to a reliable lawyer in the beginning would have saved all this. He would have discovered the flaw at a time when it could be remedied, or at least before the land was improved and made more valuable by the erection of a dwelling and of other buildings, and his charge would have amounted, as a rule, to less than a small percentage of the amount necessary to defend the title once it was attacked.

We cannot too strongly advise the prospective builder to have the title of his land examined by a careful and competent lawyer before going to the expense of erecting a house thereon, unless the owner has received his title direct from the government.

Location of the Buildings.

The title having been settled, the question of location next deserves attention. The first, and by all odds the most important, consideration is that of healthfulness. Build on low, ill drained ground, and ill health will follow as inevitably as night follows day. A dry, well drained soil is absolutely essential, but the question of air drainage should not be lost sight of. A hollow, however porous and well drained the soil, will prove a cold and frosty spot in winter, a hot and sultry one in summer. A site too closely shut in by timber will lose what it may gain in shade by the absence of free circulation of air, by the cutting off of every breeze during the sultry days of summer, and in winter the absence of sunlight is again a drawback.

Advantages of Hillside Slope.—All things considered, a gentle hillside slope offers the greatest advantages, and, if a hillside where the highest land is to the north and west, little more could be desired.

Proximity to Strip of Timber.—In many portions of the country a strip of timber of greater or less extent to the north and west is an essential, not only to the comfort of the house, but to the comfort of those who are obliged to do chores about it in the severe weather, as well as to the stock which must be quartered near it.

Shade Trees.—Again, a few fine shade trees are a great addition to both the comfort and beauty of the farm home, and while trees may be planted and will grow in time, other things being equal, the advantage of building near a few fine trees should not be lost sight of.

The Well.—After the consideration of healthfulness there is, perhaps, none more important than that of water. A good well cannot be secured everywhere, and there is no greater inconvenience than to have the well located far from the house. In fact, the nearer it is the better.

The Barn and Kitchen Garden.—Before definitely deciding on a site, some other points should be looked into. The saving of time, labor and exposure to be gained by having the barn, and especially the stabling, reasonably near the house should not be lost sight of, and therefore suitable sites for these necessary buildings should not be decided upon before definitely locating the house site. Good soil about the house is also desirable. With good soil an attractive dooryard is easily possible and while the prospective builder may reflect that a few loads of manure will bring up the soil, he should also remember that both the manure and the time to haul it may prove none too abundant, especially during the first two years of his occupancy. The possibility of locating the kitchen garden conveniently near, and also the chicken house and yards, is worthy of consideration.

Distance From the Road.—If your location is too far from the road the almost inevitable loneliness and isolation of farm life is intensified. On the other hand, if too near the road, all privacy is lost, the dust becomes an annoyance and a source of injury, and there is an undesirable appearance of being crowded for room. A sward 100 feet wide with a driveway along one edge which approaches the house with a gentle curve, presents the nicest possible appearance and gives the house an air of repose that nothing else will do. If the sward be lined on its outer edges with fine shade trees, an attractive setting is assured.

Plan of the House. Too much care and thought cannot be devoted to the plan of the house itself. Generally speaking, no one is so competent to plan a comfortable, convenient house, adapted to all his needs, as the farmer himself, unless it be his wife, but it requires plenty of time and thought. To successfully plan a house one should be able to picture to himself every room and every passage.

Preliminary Drawing.—Having conceived the general idea of the house to be built, the next step is to lay it out on paper, and a far better idea of the size and proportion of the rooms will be gained if the drawing is made to a scale. This is not a difficult feat. Let $\frac{1}{4}$ inch on the 2-foot rule equal 1 foot. Allow for whatever thickness of studding may be decided on, and add 1 inch for lath and plaster on each side of partitions, 1 inch each for lath and plaster, for sheathing and for siding on outside walls, and a plan sufficiently accurate for practical purposes will be obtained. Get the advice and counsel of the wife, explaining to her whatever on the plans she may not understand. By consulting her convenience in various ways you may save this busy woman many thousands of useless steps every week of her life. Remember that corners cost money and let in cold. The nearer a house approaches to a square or rectangle the cheaper will be its construction and the more solid and substantial will it prove when completed. Bay windows are an expensive luxury and are no longer in style. Keep in mind when planning the house the construction of the roof. A simple roof is cheaper and less liable to leak. Valleys are apt to cause trouble.

Employment of Architect or Builder.—When your plan is completed to your own satisfaction submit it to an architect or an experienced builder. Get him to point out any possible improvements, and adopt them if you can see that they are improvements. Especially invite him to point out defects. Let him make your working drawings and prepare your bill of materials. Unless you have had wide experience, he will save you all and more than his fee will amount to.

The Contract.—Sometimes it will pay to let the contract for the whole or a part of the house; but in case that is done, insist upon being your own superintendent, with power to reject any material or workmanship that does not come up to your idea of the quality contracted for, and have these conditions specified in the contract.

The Farmer as His Own Contractor.—As a rule the farmer with his team, more or less of his own time, and often that of one or more hands, will find it cheaper to be his own contractor, hiring such skilled and other labor as may be necessary, doing his own excavating, hauling, etc., contracting directly with a mill for his lumber.

Prices of Mill Work.—The prices of one mill should seldom be accepted without obtaining those of a competitor. Sometimes a mill at a considerable distance will be willing to pay freight and make lower prices than the local mill. At all events competition should be invited.

Cash Purchases.—Generally speaking, it will pay, where ready cash is not at hand and when it is at all practicable, to borrow the money and pay cash for the material, thereby obtaining the lowest prices. Sometimes it is possible to obtain a loan similar to those made by the building and loan associations, viz., the lender will advance the money for the building, taking as security a mortgage on the house and some land, the money to be paid directly to the person furnishing the material, on order of the owner, for labor on presentation of receipted pay rolls, thus insuring that the money advanced is invested in that which constitutes the collateral for the loan.

In the event of a contract being let to a contractor or builder the owner should assure himself that the workmen are being paid promptly, as, in most states, the owner has few rights as against a mechanic's lien, and he also should satisfy himself that the materials are or will be paid for without recourse to him.

Cheap Farm Residence.

Owing to a variety of circumstances it not infrequently happens that the farmer finds himself in a position where the building of a residence is an imperative necessity while sufficient ready money for such an undertaking is not available.

A cheap, but incommodious and inconvenient structure, or a heavy mortgage, with its never failing interest, too frequently an addition to a mortgage already given on the land, seem the only alternatives, and it is especially to mitigate such conditions that the simple plans submitted herein have been prepared.

It often occurs, too, that when the occasion arises for adding to the home no practicable plan presents itself and an entire and expensive remodeling, if not a complete new building, becomes necessary. This situation might frequently have been avoided had the original structure been built along the lines of a preconceived plan which provided for eventual enlargement.

Two Plans for Residences.

The following plans provide in each case for an inexpensive main building, capable of considerable enlargement and development without the undoing or alteration of practically any of the original work and the gradual erection of a convenient and commodious home.

A \$600.00 House.—The first plan (Figures 1, 2 and 3), provide a main building with a living room

15x15 feet, a back room 9 feet 6 inches by 10 feet 6 inches, with a commodious closet, with a staircase from the first floor, while upstairs are two chambers, respectively 15x15 feet and 9 feet 6 inches by 10 feet 6 inches.

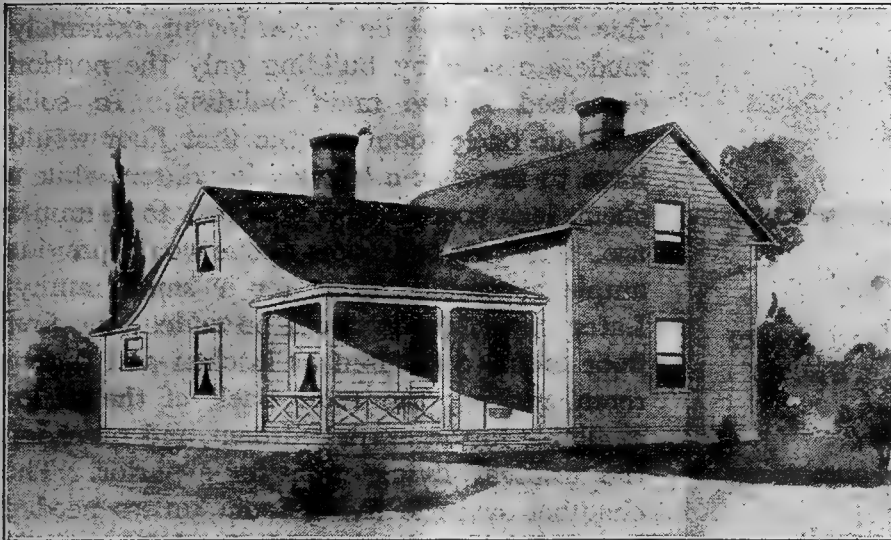


Figure 1.
A \$600.00 Farm House with \$500.00 Addition.

A \$500.00 Addition.—The plan

provides for a further addition when necessity for enlargement of the house arises and the financial condition of the owner permits. This addition will be 16 by 28 feet, providing on the first floor a living room and kitchen and on the second floor a bed chamber. The kitchen will be 11 feet by 11 feet 6 inches, with a pantry and

stairway to cellar. The walls of the main building are 14 feet and those of the addition 12 feet, the lower ceiling of the chamber over the living room proving no serious detriment in so large a room. The house as completed should also have a porch 8x15½ feet, large enough to prove not only an ornament, but a great convenience during the warmer portion of the year.

Possible Enlargement.—Should additional room ever be required, one or two bedrooms can be added to the right of the kitchen. A simple extension similar to the kitchen, across the back of the main building, would give a room opening off the kitchen 11 by 15 feet, which might be used as a bedroom or divided into storeroom, milk room, etc.

An equally feasible enlargement could be obtained by extending the main building 12 feet back. This would give the room already described off the kitchen and a chamber of equal size above, to be reached by providing a short stairway leading up from the first landing of the original staircase. The window

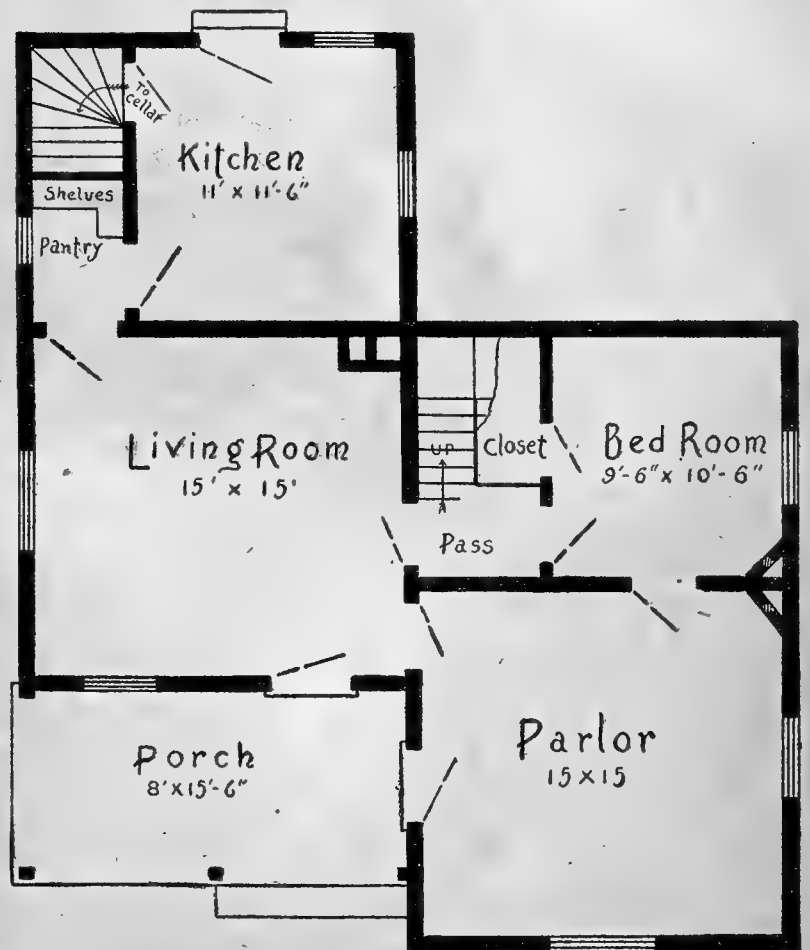


Figure 2.
First Floor of \$600.00 Farm House with \$500.00 Addition.

in the back room on the first floor is placed in the side wall to allow of just such an extension. Two chimneys built from the ground permit of heating every room except the last two suggested, and should that addition be anticipated when the original structure is erected an additional flue for that purpose could be added to the large chimney in the living room, the extra flue to project into the corner of the kitchen.

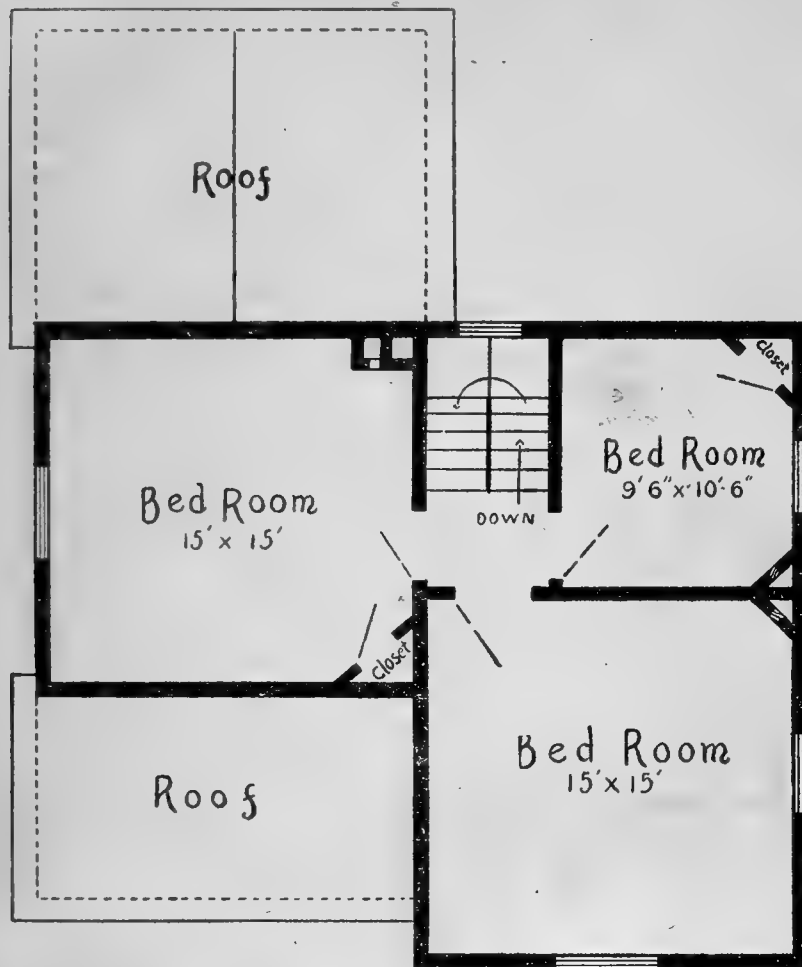


Figure 3.
Second Floor of \$600.00 Farm House with \$500.00 Addition.

Should necessity for economy dictate, this house could be begun for an extremely moderate sum by building only the portion described as the main building. In such case the back room on the first floor would have to serve as a kitchen in winter, while a cheap lean-to could be provided for summer use. The two bedrooms above would provide ample accommodations for a small family. Later the addition could be added, the first floor room to be used as kitchen and dining room, making the room back of the parlor available for an extra bedroom, and reserving the original living room for a parlor. The chamber over the living room, unless needed for immediate use, could be left entirely unfinished until its use as an additional bedroom became necessary, although, if simply floored, it would prove a convenient storeroom until such time as its completion could be afforded, quite possibly until after the kitchen, pantry, etc., had been built.

The next step would be the building of the porch, which would greatly add to the appearance of the house, and with this completed a very comfortable and convenient house would have been secured, little by little, and on the economical and convenient pay as you go plan.

Cost of Materials.—We give two bills of materials for this house. The first provides only for the main building and for a style of building suitable only to the extreme southern portion of this country. A competent architect, figuring on the bill of materials as given, and including in his estimate the entire cost of labor, places the cost of the main building complete at \$658.68, lumber being figured at \$24.00 per 1,000 feet, and carpenters' wages at \$2.50 per day.

It will be noticed that the bill of materials calls for foundation posts 1 foot long. These, however, should, of course, extend below the frost line, and their length will therefore vary with the latitude in which the house is built. The price quoted, 25 cents per post, will cover the cost of posts of any ordinary length. Of course, the farmer could, in many cases, obtain posts simply for the cost of cutting. No sheathing or building paper is provided for, and only a single floor for the first story is estimated on in giving the cost, but the amount of sheathing lumber and building paper required are given separately, as are also the extra flooring and paper required to double floor the first story.

Anywhere but in the far South these extras will be most advisable, if not essential. On the other hand, the amount of labor, hauling and excavating which the farmer will be able to perform himself will very nearly offset the increased cost, and so it may be safely stated that even for the most northern states the farmer can, by performing a portion of the labor himself, erect the main building in a manner that will render it extremely comfortable for but little more than \$600.00, the cost of lumber and wages remaining the same as those figured on.

A bill of materials for the addition is also given, to which the above remarks equally apply. The bill calls for sufficient material to build the addition complete, including veranda, kitchen, etc., and the estimated cost, figured on the same basis as the main building, is \$658.68. This expense could, of course, be incurred little by little as previously suggested.

When the house is completed the owner will find himself in possession of a comfortable, roomy house, containing seven good rooms, which has not cost him over \$1,200.00, and one that is still capable of further enlargement at his convenience.

BILL OF MATERIALS FOR COTTAGE.

Main Part of House, Design No. 1.

Dimensions, 16x27 feet. Walls, 16 feet. Ceilings, first story, 9 feet; second story, 8 feet.

5 pieces, 6x 8 inches, 16 feet long,	320 feet B.M. for sills.	
2 pieces, 6x 8 inches, 12 feet long,	96 feet B.M. for sills.	
37 pieces, 2x 8 inches, 16 feet long,	790 feet B.M. for joists, floor and porch.	
6 pieces, 2x 8 inches, 12 feet long,	96 feet B.M. for joists.	
4 pieces, 4x 4 inches, 16 feet long,	86 feet B.M. for corner studding.	
150 pieces, 2x 4 inches, 16 feet long,	1,600 feet B.M. for studding, plates, ceiling joists, collar beams, etc.	
42 pieces, 2x 4 inches, 14 feet long,	392 feet B.M. for rafters.	
4 pieces, 1x 6 inches, 16 feet long,	32 feet B.M. for joist bearers.	
3 pieces, 2x10 inches, 16 feet long,	80 feet B.M. for stair horses.	
150 pieces, 1x 3 inches, 16 feet long,	600 feet B.M. for roof sheathing, etc.	
Total.	4,092 feet, at \$24.00 per M	\$98.20
18 posts, 6x6 inches, 1 foot long, at 25 cents, for foundation		4.50
3,600 cypress shingles, 5x20 inches, at \$6.50 per M.		23.40
1,800 feet 1/2-inch pine siding, dressed two sides, at \$27.00 per M.		48.60
1,050 feet 7/8-inch No. 2 matched pine flooring, at \$23.00 per M.		24.15
112 lineal feet O. G. crown mold, for cornice		2.52
103 lineal feet bed mold		1.28
7 pieces, 7/8x12 inches, 16 feet long, for planscia		2.80
7 pieces, 7/8x 8 inches, 16 feet long, for frieze		2.06
7 pieces, 7/8x 4 inches, 16 feet long, for fascia.		1.03
7 pieces, 7/8x 6 inches, 16 feet long, for outside base, dressed two sides.		1.40
7 pieces, 1/4x 2 inches, 16 feet long, heart pine, for water table		1.00
2 outside doors, 2 feet 10 inches by 6 feet 10 inches by 1 3/4 inches		6.00
2 casings for outside doors		4.50
3 windows, 4 lights, glass 14x30 inches, and 3 cased frames for same, with sash weights and cords		14.50
2 windows, 4 lights, glass 14x28 inches, and 2 cased frames for same, with sash weights and cords		9.00
2 windows, 6 lights, glass 10x14 inches, and 2 cased frames for same, with sash weights and cords		7.00
4 pieces, 1 1/8x4 1/2 inches, 16 feet, dressed two sides; 4 pieces, 1 1/8x3 1/2 inches, 16 feet, dressed two sides, for corner boards, etc.		1.08

Inside Finish.

2 inside doors, 2 feet 10 inches by 6 feet 10 inches by 1 3/8 inches	\$ 6.00
4 inside doors, 2 feet 8 inches by 6 feet 8 inches by 1 3/8 inches	8.00
6 door frames for above, 5 3/4x1 1/2 inches	3.00
240 lineal feet pine base board, 7/8x8 inches, dressed two sides	4.00
240 lineal feet base mold, 1x1 1/2 inches	3.60
240 lineal feet shoe, 1/2x1 1/4 inches	1.60
28 lineal feet window stool, 1 1/8x3 1/2 inches, O. G. face	.56
385 lineal feet 5-inch casing mold	7.70
42 corner blocks, 5x5x1 1/8 inches	1.68
32 base blocks, 5x8x1 1/8 inches	1.92

Bill of Materials for Cottage, Design No. 1.—Continued.

3 pieces, 1 $\frac{1}{8}$ x12 inches, 16 feet, stepping plank, dressed two sides	\$ 2.00
3 pieces, $\frac{7}{8}$ x8 inches, 16 feet, risers, dressed two sides	.90
3 pieces, $\frac{7}{8}$ x12 inches, 16 feet, dressed two sides, for staircase	1.20
1,400 brick and laying, for chimney, including 1 $\frac{1}{2}$ barrels lime, 1 yard sand	27.00
Plastering, 350 yards, including 7 $\frac{1}{2}$ barrels lime, 5 yards sand, 4 bushels hair, 5,250 laths, 55 pounds 3-penny nails	87.50
Painting, including 3 $\frac{1}{2}$ gallons outside primer, 3 $\frac{1}{2}$ gallons body paint, 2 gallons trimmer paint, $\frac{1}{4}$ gallon sash paint, 2 $\frac{1}{2}$ gallons inside paint, or filler and hard oil, 3 coats outside and in	112.00
Hardware, including $\frac{1}{2}$ keg 20-penny nails, 1 keg 10-penny nails, $\frac{1}{2}$ keg 8-penny nails, $\frac{1}{2}$ keg 8-penny casing nails, $\frac{1}{2}$ keg 4-penny shingle nails, 2 pounds 10-penny casing nails, 20 pounds 8-penny casing nails, 10 pounds 6-penny casing nails, 8 pair hinges, 1 front door lock, 6 mortise locks, 1 closet catch, 6 sash fastenings, 4 pairs sash lifts, 7 rubber tipped door stops, $\frac{1}{2}$ gross coat and hat hooks, etc.	24.00
Tin work, including 52 lineal feet gutter, 60 lineal feet conductor	12.00
Carpenter work	100.00
Total	\$658.68

Extra for Sheathing.

1,500 square feet $\frac{7}{8}$ -inch sheathing	\$18.00
1,800 square feet building paper	3.60
Carpenter work	9.40
Total	\$31.00

Extra for Double Flooring, First Story.

450 square feet sub floor	\$ 5.40
400 lineal feet strips, 1x2 inches	.45
500 square feet building paper	1.00
Carpenter work	4.00
Total	\$10.85

BILL OF MATERIALS FOR ADDITION TO COTTAGE.

Design No. 1.

Dimensions, 16x18 feet. Walls, 12 feet. Ceiling, first story, 9 feet; second story, 8 feet.

3 pieces, 6x8 inches, 16 feet long, 192 feet B. M. for sills.	
2 pieces, 6x8 inches, 14 feet long, 112 feet B. M. for sills.	
1 piece, 4x6 inches, 24 feet long, 48 feet B. M. for porch sill.	
53 pieces, 2x8 inches, 16 feet long, 1,132 feet B. M. for joists.	
98 pieces, 2x4 inches, 12 feet long, 704 feet B. M. for studding.	
46 pieces, 2x4 inches, 14 feet long, 430 feet B. M. for rafters.	
2 pieces, 2x6 inches, 16 feet long, 32 feet B. M. for hip rafters.	
25 pieces, 2x4 inches, 16 feet long, 266 feet B. M. for studding and plates.	
12 pieces, 2x6 inches, 12 feet long, 144 feet B. M. for ceiling joists.	
200 pieces, 1x3 inches, 16 feet long, 800 feet B. M. for roof sheathing.	
Total	3,860 feet B. M., at \$24.00 per M. \$92.64
14 posts, 6x6 inches, 1 foot long, for foundations, at 25 cents	3.50
5,200 cypress shingles, 5x20 inches, at \$6.50 per M.	33.80
40 lineal feet boards, 1x6 inches, for joist bearers	.24
160 square feet beaded ceiling, for porch	3.20
1,000 square feet $\frac{7}{8}$ -inch matched flooring	23.00
1,000 square feet $\frac{1}{2}$ -inch pine siding, dressed two sides	17.00
128 lineal feet 3 $\frac{1}{2}$ -inch crown mold, for cornice	2.75

Bill of Materials for Addition to Cottage, Design No. 1.—Continued.

125 lineal feet $1\frac{1}{4}\times 1\frac{1}{2}$ -inch bed mold, for cornice	\$ 1.80
8 pieces, $\frac{7}{8}\times 12$ inches, 16 feet long, pine, dressed two sides, for planscia	3.20
8 pieces, $\frac{7}{8}\times 8$ inches, 16 feet long, pine, dressed two sides, for frieze	2.40
8 pieces, $\frac{7}{8}\times 4$ inches, 16 feet long, pine, dressed two sides, for fascia	1.20
4 windows, 4 lights, glass 14x30 inches, and 4 cased frames for same, with sash weights and cords	19.00
1 window, 4 lights, glass 14x28 inches, and 1 cased frame for same, with sash weights and cords	4.75
1 window, 6 lights, glass 8x10 inches, and 1 cased frame for same, with sash weights and cords	3.50
2 outside doors, 2 feet 10 inches by 6 feet 10 inches by $1\frac{3}{4}$ inches, and 2 cased frames for same	10.50
5 pieces $\frac{7}{8}\times 6$ inches, 16 feet long, pine, dressed two sides, for outside base boards	1.00
5 pieces, $1\frac{1}{4}\times 2$ inches, 16 feet long, heart pine, for water table .....	.80
4 pieces, $1\frac{1}{8}\times 4\frac{1}{2}$ inches, 12 feet long, for corner boards; 4 pieces, $1\frac{1}{8}\times 3\frac{1}{2}$ inches, 12 feet long, for corner boards	1.00

Interior Finish.

3 inside doors, 2 feet 10 inches by 6 feet 10 inches by $1\frac{3}{8}$ inches, and 3 cased frames for same	\$ 9.00
2 doors, 2 feet 8 inches by 6 feet 8 inches by $1\frac{3}{8}$ inches, and 2 cased frames for same	5.00
192 lineal feet pine base boards, $\frac{7}{8}\times 8$ inches, dressed two sides	3.60
192 lineal feet base mold, $1\times 1\frac{1}{2}$ inches	2.80
192 lineal feet base shoe, $\frac{1}{2}\times 1$ inch	1.50
295 lineal feet 5-inch casing mold	3.80
34 corner blocks, turned center, $5\times 5\times 1\frac{1}{8}$ inches	1.75
22 base blocks, $5\times 8\times 1\frac{1}{8}$ inches	1.30
150 lineal feet $\frac{7}{8}\times 12$ inches pine boards, dressed two sides, for porch and shelves	3.75
Plastering, 250 yards, including $5\frac{1}{2}$ barrels lime, 4 yards sand, $2\frac{1}{2}$ bushels hair, 3,750 laths, 30 pounds 3-penny lathing nails	62.50
Chimney, including 1,400 brick, $1\frac{1}{2}$ barrels lime, 1 yard sand	27.00
Tin work, including 33 lineal feet gutter, 30 lineal feet of conductor	8.00
Painting, 3 coats, including $2\frac{1}{2}$ gallons outside primer, $2\frac{1}{2}$ gallons body paint, 1 gallon trimmer paint, $\frac{1}{4}$ gallon sash paint, 1 gallon floor paint, $\frac{1}{2}$ gallon ceiling paint, $1\frac{1}{2}$ gallons inside paint	90.00
Hardware, including $\frac{1}{4}$ keg 20-penny nails, $\frac{1}{2}$ keg 10-penny nails, $\frac{1}{4}$ keg 10-penny casing nails, $\frac{1}{4}$ keg 8-penny casing nails, $\frac{1}{2}$ keg 6-penny casing nails, 25 pounds 4-penny shingle nails, 8 pairs hinges, 1 front door lock, 7 mortise locks, 5 sash locks, 5 sash lifts, 8 rubber tip door stops	18.00
Carpenter work	90.00
Total	\$553.28

Extra for Sheathing.

800 square feet $\frac{7}{8}$ -inch pine sheathing	\$ 9.60
1,000 square feet building paper	2.00
Carpenter work	5.00
Total	\$16.60

Extra for Double Flooring, First Story.

420 square feet sub flooring	\$ 5.00
500 lineal feet 1×2 -inch strips	1.00
500 square feet building paper	1.00
Carpenter work	3.00
Total	\$10.00

A \$1,200.00 House.—The second design given (Figures 4, 5 and 6) provides for a somewhat roomier house, an attractive exterior design, and one capable of being made into a larger, finer residence eventually. The first cost is somewhat greater, although there is but little difference in the cost of the completed structures.

A smaller area of outside wall in proportion to the interior makes it easier to heat, and the general compactness of the design will lighten the labor and shorten the steps of the housewife.

The design contemplates the practical completion of the exterior in the beginning, the second story, with the exception of the hall, being left for subsequent completion.

A large living room, a conveniently large kitchen, and two good sized bedrooms, together with a large covered porch, take up the space on the first floor. The second floor, when completed, will provide a hall, a garret, two bedrooms, and bathroom, all roomy and well lighted. A single chimney with two flues is so placed as to make it possible to have a stove in each of the first floor rooms, while a large heater placed in the upstairs hall would give sufficient heat on that floor.

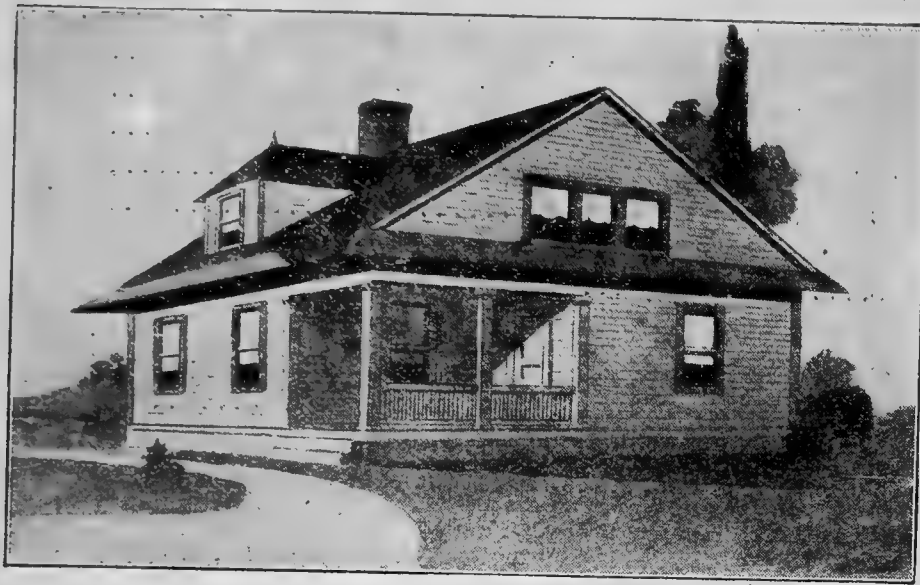


Figure 4. A \$1,200.00 House.

The design has the virtue of originality, beauty, and a general appearance of comfort, and it is, moreover, capable of considerable enlargement. The pantry under the stairs may be lighted by the window which serves to light the stairway, if a few of the stairs risers are omitted, thus allowing the light to shine through the steps. The double doors between kitchen and living room serve to keep odors of cooking out of the latter.

Cost of Materials.—The remarks made in regard to the bill of materials for Design No. 1 apply equally to the bill given for this house. The first bill provides for completing the entire exterior, the first floor interior, and the second story hall, which can easily be used for a bedroom at first, as it is well lighted and easily heated. The cost, estimated on the same basis as the previous design, is placed at \$1,041.60, the cost of completing the second story at \$100.00, making the total cost \$1,141.60.

between kitchen and living room serve to keep odors of cooking out of the latter.

The first bill provides for completing the entire exterior, the



Figure 5. First Floor of \$1,200.00 House.

BILL OF MATERIALS FOR COTTAGE.

Design No. 2.

Dimensions, 34x27½ feet. Walls, 14 feet. Ceilings, first floor, 9 feet; second floor, 8 feet. This bill provides for completing first floor, and hall on second floor.

3 pieces, 6x8 inches, 16 feet long, 192 feet B. M. for sills.

4 pieces, 6x8 inches, 14 feet long, 224 feet B. M. for sills.

6 pieces, 6x8 inches, 12 feet long, 288 feet B. M. for sills.

1 piece, 2x8 inches, 14 feet long, 19 feet B. M. for porch sill.

1 piece, 2x8 inches, 9 feet long, 12 feet B. M. for porch sill.

36 pieces, 2x8 inches, 15 feet long, 520 feet B. M. for first floor joists.

18 pieces, 2x8 inches, 12 feet long, 288 feet B. M. for first floor joists.

6 pieces, 2x8 inches, 13 feet long, 104 feet B. M. for porch joists.

Bill of Materials for Cottage, Design No. 2.—Continued.

- 27 pieces, 2x8 inches, 15 feet long, 540 feet B. M. for second floor joists.
- 27 pieces, 2x8 inches, 13 feet long, 468 feet B. M. for second floor joists.
- 27 pieces, 2x6 inches, 16 feet long, 438 feet B. M. for ceiling joists.
- 5 pieces, 4x6 inches, 14 feet long, 140 feet B. M. for main studs.
- 100 pieces, 2x4 inches, 14 feet long, 933 feet B. M. for studding.
- 35 pieces, 2x4 inches, 10 feet long, 233 feet B. M. for studding.
- 25 pieces, 2x4 inches, 18 feet long, 300 feet B. M. for studding.
- 75 pieces, 2x4 inches, 9 feet long, 450 feet B. M. for studding.
- 50 pieces, 2x4 inches, 8 feet long, 267 feet B. M. for studding.
- 50 pieces, 2x4 inches, 14 feet long, 467 feet B. M. for plates, etc.

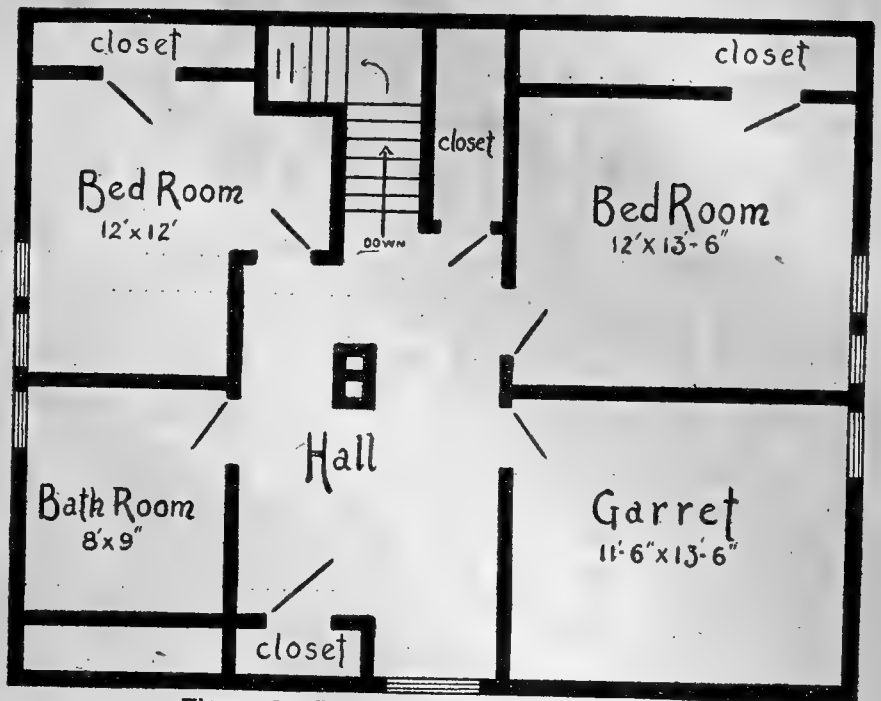


Figure 6. Second Floor of \$1,200.00 House.

- 40 pieces, 2x6 inches, 18 feet long, 720 feet B. M. for rafters.
- 150 lineal feet, 1x6 inches 75 feet B. M. for joist bearers, etc.
- 400 lineal feet, 1x3 inches 100 feet B. M. for bridging, etc.
- 875 square feet, 1x5 inches 875 feet B. M. sheathing for roof, etc.
- Total 7,653 feet B. M., at \$24.00 per M. \$183.66

- 28 posts, 6x6 inches, for foundation 7.00
- 2,000 square feet pine siding, 1/2x5 1/2 inches, at \$27.00 per M. 54.00
- 115 square feet beaded ceiling, 5/8x3 1/2 inches, for porch 3.45
- 1,200 square feet matched flooring, 7/8x3 1/2 inches 27.60
- 125 square feet matched heart flooring, 7/8x3 1/2 inches, for porch. 3.12
- 140 lineal feet outside base, 7/8x8 inches, dressed two sides 2.37
- 115 lineal feet water table, 1 1/4x2 1/2 inches50
- 100 lineal feet corner boards, 1 1/4x4 1/4 inches, dressed two sides 3.00
- 10 lineal feet angle strips, 1 1/4x1 1/4 inches.10
- 50 lineal feet square, round37
- 230 lineal feet O. G. crown mold, for cornice 5.06
- 230 lineal feet, 7/8x4 inches, for fascia for cornice, dressed two sides 2.07
- 230 lineal feet, 7/8x8 inches, for frieze for cornice, dressed two sides 4.14
- 230 lineal feet, 7/8x12 inches, for planscia for cornice, dressed two sides 6.21
- 4 pieces 2x4 inches 6 feet long, dressed four sides, for porch rails80
- 60 lineal feet 1 3/4x1 3/4 inches, dressed four sides, for porch balusters60
- 2 porch columns 3.00
- 2 porch half columns 1.75
- 1 front door, 2 feet 10 inches by 6 feet 10 inches by 1 3/4 inches, complete with frame and trim 7.00
- 1 rear door, 2 feet 10 inches by 6 feet 10 inches by 1 3/4 inches, complete with frame and trim 6.00
- 5 first floor inside doors, 2 feet 10 inches, by 6 feet 10 inches by 1 3/8 inches, complete with frame and trim 24.85
- 1 first floor closet door, 2 feet 6 inches by 6 feet 6 inches by 1 3/8 inches, complete with frame and trim 4.12
- 4 second floor doors, 2 feet 8 inches by 6 feet 8 inches by 1 3/4 inches, complete with frame and trim. 16.48

Bill of Materials for Cottage, Design No. 2.—Continued.

1 second floor closet door, 2 feet 6 inches by 6 feet 6 inches by $1\frac{3}{8}$ inches, complete with frame and trim	\$ 4.12
1 second floor closet door, 2 feet 6 inches by 5 feet by $1\frac{3}{8}$ inches, complete with frame and trim	4.12
9 windows, 4 lights, 14x30 inches, $1\frac{3}{8}$ -inch check rail, complete with frame, weights, cord and finish	47.25
9 windows, 9 lights, 10x12 inches, $1\frac{3}{8}$ -inch pivoted, complete with frame, weights, cord and finish	30.00
1 dormer window complete with glass, frame, finish, etc	6.00
185 lineal feet inside base, $\frac{7}{8}$ x8 inches, molded	3.06
10 lineal feet closet base, $\frac{7}{8}$ x8 inches . . . . .	.20
1,500 cypress sap shingles, 5x20 inches, at \$4.25 per M. for gables	6.48
6,150 cypress heart shingles, 5x20 inches, at \$6.50 per M. for roof	39.98
Hardware, including 1 keg 20-penny nails, 2 kegs 10-penny nails, 1 keg 8-penny nails, 1 keg 8-penny casing nails, 1 keg 4-penny shingle nails, 30 pounds 6-penny casing nails, 16 pairs hinges, 1 front door lock, 13 mortise locks, 9 sash locks, 9 sash lifts, 6 sets pivot sash locks, workers, etc	36.00
Chimney, including 1,500 bricks, $1\frac{1}{2}$ barrels lime, $1\frac{1}{2}$ yards sand	27.00
Plastering, 442 yards, including 9 barrels lime, 6 yards sand, 5 bushels hair, 6,630 laths, 50 pounds 3-penny lath nails, etc	111.50
Tin work, including 12 lineal feet 16-inch valley flashing, 50 lineal feet 3-inch conductor, 75 lineal feet gutter	13.78
Painting, including 6 gallons outside primer, 7 gallons body paint, 2 gallons trimmer paint, $\frac{1}{2}$ gallon sash paint, 1 gallon floor paint, $\frac{1}{2}$ gallon veranda ceiling paint, 5 gallons inside paint or filler and varnish	140.00
Carpenter work, figured at \$2.50 per day	234.86
Total	<u>\$1,041.60</u>

Extra for Sheathing.

1,500 square feet $\frac{7}{8}$ -inch sheathing	\$18.00
1,800 square feet building paper	3.60
Carpenter work and nails	8.40
Total	<u>\$30.00</u>

Extra for Double Flooring, First Floor.

900 square feet sub floor	\$10.80
660 lineal feet, 1x2-inch strips	1.32
1,000 square feet building paper	2.00
Carpenter work and nails	3.00
Total	<u>\$17.12</u>

BILL OF MATERIALS FOR COMPLETING COTTAGE.—Design No. 2.

Finishing off Two Bedrooms, Bath, Two Closets, etc.

750 square feet matched flooring, $\frac{7}{8}$ x3 $\frac{1}{2}$ inches	\$17.25
2 closet doors, 2 feet 6 inches by 5 feet by $1\frac{3}{8}$ inches	6.04
165 lineal feet molded base, $\frac{7}{8}$ x8 inches	2.80
40 lineal feet molded closet base, $\frac{7}{8}$ x8 inches . . . . .	.65
$\frac{1}{2}$ keg 10-penny finishing nails	1.40
2 mortise locks and knobs	1.50
2 gallons paint	1.75
Plastering, 200 yards, including 6 barrels lime, 4 yards sand, 3 bushels hair, 3,000 lath, 35 pounds 3-penny lath nails	50.00
Carpenter work	18.61
Total	<u>\$100.00</u>

Possible Improvements.—Among the improvements which may be added as desired is a short, ornamental staircase in the living room leading up to the first landing of the other stair. This would obviate the necessity of going through the kitchen to get upstairs.

A further change would be to enclose the porch and place a staircase in the hall so made, leading up into the space marked garret in the plan. If this change is made the bedroom to the left of the hall should be converted into a parlor or reception room, a change quite possible with the completion of the second story bedrooms.

In case this change is contemplated the doorway between the bedroom and porch should be provided for in the wall, the studding placed at proper distances, with cross stud and cripples, or short studding, in place, the studding doubled on either side, etc. Studding the exact height of the door can then be set in place, and the whole lathed over and plastered and so left until the time comes to use this door. This will save expense and weakening of the wall when the time comes to make the change. Furthermore, the front door should be placed far enough to the left to allow of room for the staircase, which will save moving it later.

The house is susceptible to an addition at the back of almost any size and at any time. The addition would take in the window in the rear wall of the living room, the window becoming a door, and might extend to the kitchen door, the only change necessary being the transferring of the window in the stairway and pantry of the kitchen wall of the same, so that they would receive their light from the kitchen. If the addition were built two stories high, communication with the second story could be had by changing the long closet into an extension of the hall.

Should the porch be changed into a hall, a veranda built about its two sides would prove a grateful addition.

In both of these designs various modifications and additions will suggest themselves, whereby expense may be saved or improvement made. For instance, the railing around the porch may be dispensed with, a glazed door may be added, and so on.

A house built on either of these plans will prove convenient and economical. Both plans serve well to illustrate the theory of evolution as applied to house building, which it is desired to make most clear.

The Foundation. Both location and expense must govern the style of foundation adopted. The cheapest foundation consists of short posts extending from below the frost line to a foot or more above the ground, set near enough together to adequately support the sills. Naturally these posts will rot in time; they provide no walls for a cellar, and the space between them must be either boarded up or cold floors will be the result. As a temporary expedient they serve their purpose. They will support a house fairly well for a number of years and can then be replaced by a brick or stone wall. In most localities a brick wall, two bricks (9 inches) thick, will prove the most economical and satisfactory, all things considered. Such a wall should extend well below the frost line. If there is to be, as their should, a cellar, the wall should be 7 feet high. It will pay to use well made brick and thoroughly prepared mortar. See that the lime is fresh and unslaked either by air or water. The sand should be the purest obtainable, gritty, free from dirt, gravel, etc. The latter should be removed by screening. The lime and sand should be thoroughly mixed and just wet enough to trowel well. No more water should be used than is necessary to make a good joint. The walls should be perfectly true and plumb. All joints should be broken. Sometimes the farmer will be able to lay the brick himself, but the farmer who can make a good wall is the exception. It will usually pay better to make the excavation, haul brick, lime and mortar, and then employ a good brick mason, the farmer or his hand preparing and carrying the mortar and otherwise acting as helper.

Sometimes bricks are laid in cement mortar, but there is little advantage in so doing. It is more costly, and if the land is poorly drained water will seep through the bricks, even though the mortar is waterproof. After the bricks are laid, a thin plaster of Portland cement and sand applied to the entire outside surface will render the wall waterproof, but, again, unless a cement floor is provided, and the first course of brick is bedded in cement, the water is liable to come under the wall.

Where a good brick wall is built, a lighter sill may be used than otherwise. It is a good plan to break the joint by laying the outside course one brick higher than the inside, and bedding a 2x4 on the inside, bringing the top of brick and timber level, and spiking the sill to the 2x4. In this case a sill as light as 2x8 will answer (see Figure 7). With such a sill the floor joints should extend clear across the sill and be spiked to the studding, and the floor should be extended between the studding clear to the sheathing, or siding, to prevent drafts and vermin from entering the walls. In localities where stone is plentiful a well bonded stone wall, carefully laid with good mortar, makes the most satisfactory and durable foundation.

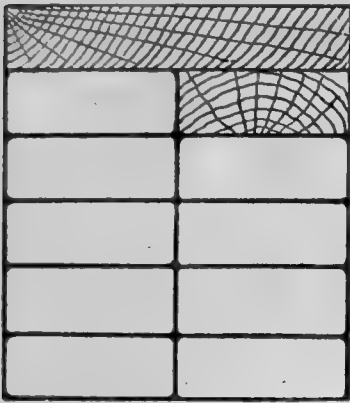


Figure 7.
Method of Breaking Joint Between Sills and Foundation.

An excellent foundation, and one that the farmer can often lay himself, is of grout. To lay it, plank frames should be prepared of the proper width, not less than 3 feet in depth and without top or bottom. The length may be any common divisor of all the walls to be laid. Sharp sand and good cement should be provided along with a sufficient quantity of broken stone. The whole should be thoroughly mixed while dry, then a small portion at a time wet up, using just enough water to wet all the material, and it should be rammed into place inside the frame, the frame being raised as the work proceeds.

The Cellar.

In building the cellar enough windows should be provided for light and ventilation and a good sized door opening outside. Double doors should be placed over the stairs leading up from this opening to the surface, and should be set at an incline that will readily shed water. The wall should extend around the space left for the stairs. In cold climates another and perpendicular door should be placed at the foot of the stairs, separating them from the cellar.

Marking the Ground.

In laying off the ground for the house two stakes should be placed at each corner, each some feet beyond the corner proper, so that when a chalk line is stretched on the stakes it will look like the illustration (Figure 8), the places where the lines cross (a) being the real corners of the house.

The lines may be squared by a triangle made of straight edged lumber, the base and perpendicular of which shall have been squared by the steel square.

A rule for proving the squareness of the lines when set is as follows: Select one corner, and 8 feet from the intersection of the lines stick a pin through the chalk line; 6 feet from the same corner on the other line place a pin, and if the diagonal distance from pin to pin is 10 feet the lines are at right angles. By applying this test at diagonally opposite corners the correctness of the lines may be assured.

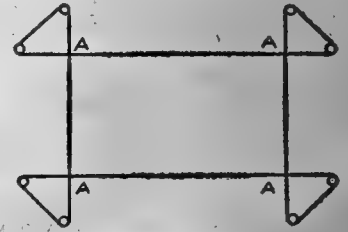


Figure 8.
Method of Staking Off Ground.

Chimneys.

All chimneys should start from the ground. Those placed on brackets are unsafe and often increase the rate of insurance. In a properly designed house of moderate size one or at most, two chimneys, each containing several flues, will serve every purpose. If possible a flue should be provided for each stove, as much better drafts are thereby obtained.

The chimney should have a solid foundation of brick or stone, and if of brick an extra footing course should be laid. The exterior walls should be two bricks thick and the division walls one brick thick. In case the chimney is lined with one of the patent fire clay linings now on the market, one brick will prove of sufficient thickness for the exterior walls. In case it is necessary to carry a stove pipe any distance inside a partition to reach the chimney a terra cotta thimble should be used, and where a pipe passes completely through a partition it should be protected by a ventilated thimble.

In no case should a stove pipe enter a chimney in a closet or an unused room. Such an arrangement is likely to increase the cost of or even make it difficult to secure insurance. The necessity of such makeshifts can invariably be avoided if sufficient care is given to the original plan, the possibility of enlargement kept in mind, and likely additions actually designed when building is first undertaken.

Precaution Against Fire.—Great care should be taken by the owner of a building to make sure that nowhere does any of the woodwork of the house bind the chimney. The careless or incompetent carpenter is always tempted to use the chimney to steady and perhaps brace his work, and such construction is dangerous in the extreme. The chimney is almost certain to settle, and as it does so it binds against the woodwork and hangs there; a crack results, and sooner or later sparks reach the doubly dry timbers and a disastrous fire ensues. Insurance adjusters claim that this is the most frequent cause of conflagrations in farm residences, and it will therefore pay to give the matter all the attention necessary to insure perfect construction.

Fireplace.—If means will permit, the house should possess at least one fireplace, preferably in the living room. There is nothing more cheerful than an open fire, nothing more conducive to a cozy family circle. Moreover, whatever may be the means employed for heating the house, there are always days in early fall and late spring when a fireplace will prove an economy, days when no fire will be needed except in the sitting room, and that more to take off the dampness than to warm the atmosphere. On such days a small wood fire in an open fireplace will make a world of difference in the comfort and healthfulness of the room, and will prove far more economical and far less troublesome than lighting a stove.

If in building the chimney a cast iron damper be provided just above the fireplace and a pipe hole cut above the mantel, the fireplace can be closed and a heating stove using the same flue can be installed when the weather becomes sufficiently severe to require it. There are now on the market a number of patented grates, etc., designed for fireplaces by which it is claimed several rooms can be heated from the one fire and the heat which was formerly lost up the chimney made available. Without being able to recommend any of these devices, the writer is strongly of the opinion that these new inventions should be investigated before building a house.

The Frame.

The usual, in fact, the only type of frame house built nowadays is that known as the balloon frame. It consists of sills, studding, plates, joists, and rafters.

Sills.—The sills may vary in vertical thickness, dependent upon the foundation. Where the latter consists of posts either of brick or wood, the vertical width of the sill should not be less than 8 inches. Should it be difficult to secure timbers of the proper size, an equally satisfactory and possibly better sill can be made by spiking together a sufficient number of 2-inch planks to secure the proper thickness. In case the sill is so made all joints should be broken just as they are broken in laying brick. If solid sills are used the joists should be rebated and the timbers spiked with hardwood pins driven into holes bored for that purpose. According to the old fashioned method of building, gairs were cut into the sills for the floor joists which were themselves cut with tenons. The more modern method, and the better, is to spike to the inner side of the sill a 2 by 4 scantling, on which rest the tenons of the joists. (See Figure 9.) By this method the sill is not only saved from the weakening of the gains, but is strengthened by the 2 by 4, while the extra expense of the 2 by 4 is more than compensated by the saving of labor.

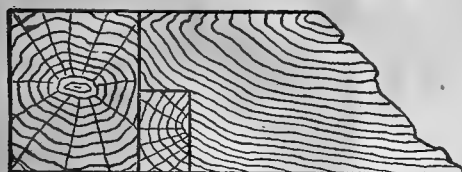


Figure 9.

Method of Supporting Floor Joist by Spiking 2 by 4 to Sill and Resting Tenon Thereon.

The horizontal width of the sill should be, ordinarily, 6 inches. This allows for 2 inches space inside the studding on which the flooring should rest, making the walls tight at the bottom and so excluding both drafts and vermin.

Floor Joists.—The floor joists should be not less than 2 by 8 and should be cross bridged once in every span of 10 feet, twice in a span of 15 feet, and so on. The additional strength and solidity of the floor will well repay the extra expense of cross bridging. (See Figure 10.)

The Studding.—The studding in almost all frame houses is 2 by 4 inches. While 2 by 5 makes a better frame, the writer doubts if the extra expense is warranted. He would, however, strongly advocate the use of a 4 by 4 or two 2 by 4's spiked together at all corners and on either side of all door and window openings. At corners he would use a 4 by 4,



Figure 10.

Cross Bridging of Floor Joists.

and on either side spike a 2 by 4. (See Figure 11.) Not only is a more solid corner thus produced, but when you come to lath your rooms you have a solid bearing for the ends of the lath on both walls, instead of being compelled to lath one wall and then tack on a strip, known to builders as a furring strip, on which to nail the ends of the laths of the other wall, a method bad at best and usually worse than bad when done by the lathers' careless slap bang methods. A badly cracked corner in the plastering is the almost inevitable result.

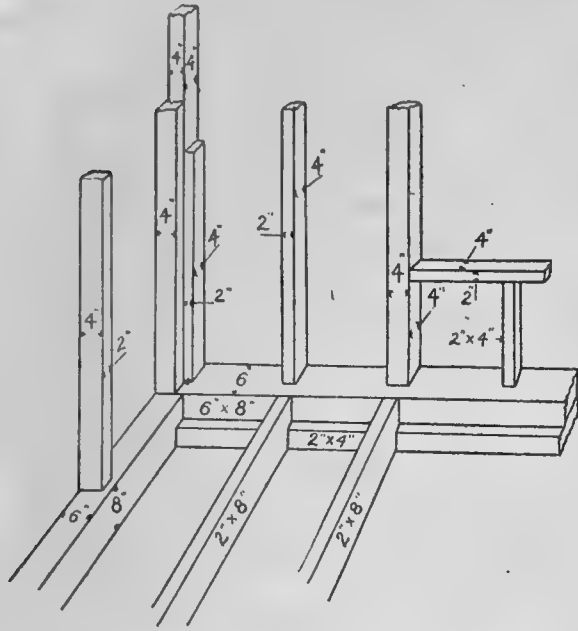


Figure 11.
Method of Placing Floor Joists, Framing,
Corners, Etc.

In completing the building, after the plasterers have gotten through their work, this floor should be covered with a layer of good building paper and 1 by 2-inch strips nailed on top of that and immediately over the joists, and then a thoroughly dry 3-inch matched floor laid on the strips, blind nailed (Figure 12) and butting squarely against the grounds. This method will give a thoroughly satisfactory floor, and the extra expense will be soon saved in the fuel, the amount of cold excluded being almost beyond belief. Such a floor finished with some good filler and an oil finish need never be carpeted, will be easily kept clean, and will prove far warmer than the ordinary floor with carpet and carpet lining. Under all circumstances rugs are to be preferred to carpets.

The second floor joists rest on bearers usually 1 by 5 or 6 inches, let into the studding at the required heights. These bearers should be let in more than their actual thickness and the lathing carried over them on furring strips. Otherwise there will be no room for the plaster to form clinches, while if the moisture in the plaster causes the bearer to swell, badly cracked plaster will be the result.

The Roof.

The roof should have a pitch of not less than one-third, or better still, one-half. A roof with the latter pitch is less likely to leak; the outward pressure on the walls is less and the exterior appearance is better. Moreover, by placing a slatted ventilator in each gable above the ceiling of the upper rooms much greater comfort in summer will be secured. A scuttle giving access to the space immediately under the roof should always be provided, and, if possible, a permanent ladder to it. Not only will this prove necessary should a leak in the roof become manifest, but in case of fire it may become the means of preventing its gaining serious headway.

Shingles.—The most popular form of covering for roofs is shingles. Properly laid, with not more than 5 inches to the weather, one nail in each shingle, and the joints double broken, they will prove entirely satisfactory, though not so enduring as slate. Where shingles are used the roof should be sheathed with strips, preferably 1 by 3 inches, nailed to the rafters, with spaces between each course of strips of not less than 1 inch. This will permit the access of air to the under side of the shingles and accelerate drying out after heavy rains, thus obviating the greatest menace to shingle roofs—rotting.

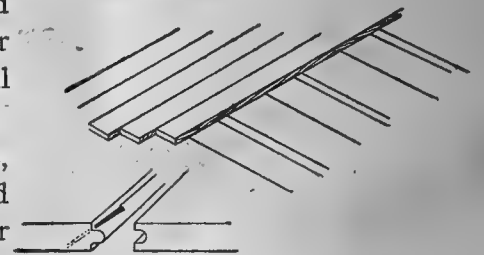


Figure 12.
Illustrating Blind Nailing Floor.

Painting.—Shingle roofs should never be painted, as the paint serves merely to retain the water under the shingle and so causes the roof to rot much sooner than if left unpainted. If it is desired to color the shingles they should be completely dipped in a pure but thin paint, or some shingle stain, prepared for the purpose. Some of the latter, it is claimed, will greatly prolong the life of the shingle. A properly dipped shingle, if the dip be thin paint, or only linseed oil, will naturally prove more impervious to moisture and, consequently, more lasting than the natural wood.

Metal Roofs.—Metal roofs of various kinds are in fairly common use. They are more expensive and somewhat more difficult to lay, but if kept well painted will last longer and are a great protection against fire, both from lightning and other causes. In fact, some insurance companies will make a reduced rate where metal roofs are used. In planning a house it should always be borne in mind that the simplest roofs are best. Flashings and valleys are always prone to leak. In lining valleys it will pay to use a good quality of tin, and paint it on both sides. Especial care must be given to the flashing around the chimneys, or they will prove a constant source of trouble and expense.

Gutters.—The gutters should be placed outside the walls; that is, farther down the roof than the point where the rafters rest on the plate. If so placed and they do leak, the probabilities are that the walls and plaster will not suffer. The tin lining of gutters should extend further up the roof than a line drawn level with the top of the gutter board. Then if the standards should become choked and the water set back it will flow over the edge of the gutter before it can rise sufficiently to seep under the tin lining.

Standpipes.—The standpipes or standards for conveying water to the ground or cistern should be of good size, and if made of corrugated iron will be less injured by ice. When there are trees sufficiently close to the house to render it likely that any considerable quantity of leaves will blow onto the roof, a light wire guard over the top opening of the standards will save them from becoming clogged and keep the cistern purer. Leaves that would otherwise have entered the standards will be retained on the outside, and on the return of dry weather will dry out and blow away.

Eaves.—Generous eaves always prove an economy in the long run from the extent to which they protect the walls from the weather. They also add to the substantial appearance of the house.

Cornice.—A plain cornice, the ends of the rafters neatly boxed with the use of the least possible amount of molding, is the present style, and a very sensible one. Ornate gables and cornices are too often used to hide inferior carpentry. They add little or nothing to the real beauty of the house and materially increase the expense.

A house with good lines, properly proportioned, needs no gingerbread or ornamentation, and a poorly planned structure cannot be improved by it. In fact, it only serves to make the cheap house look cheaper.

The Walls.

There are three essentials to a good wall—good sheathing, good paper, and good weather boarding. The first two may be omitted, but to do so is poor economy. Better, far, decrease the size of your house or finish only a small portion of the interior than slight the walls.

Next the studding there should come a sheathing of cheap lumber, but carefully put on. The best method is to place this sheathing diagonally. So placed, every board is a brace which will serve to stiffen and strengthen the frame. This sheathing should fit tight around all window and door frames and extend entirely over corner posts, plates, and sills, completely boxing the frame work of the house.

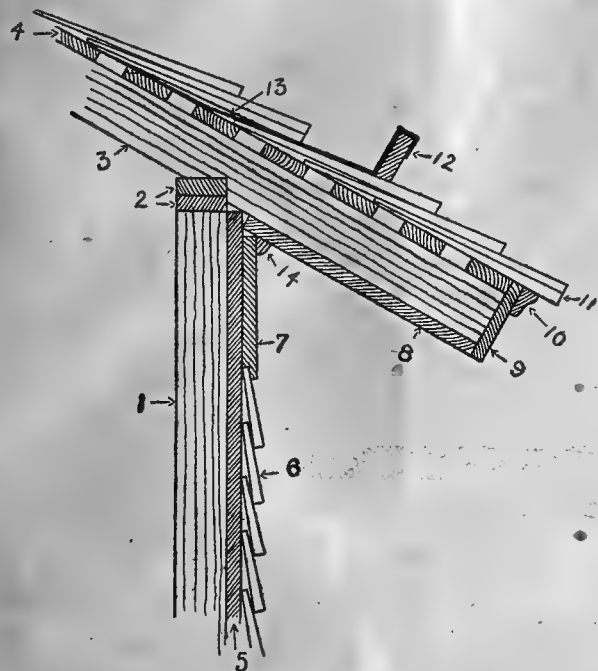


Figure 13.

Construction of Cornice. 1, studding; 2, plates; 3, rafter; 4, roof sheathing; 5, sheathing; 6, siding; 7, frieze; 8, plancia; 9, fascia; 10, crown mold; 11, shingles; 12, gutter; 13, tin gutter lining.

Building Paper.—The diagonal sheathing, although it will well repay the extra expense, may be omitted. The papering never should. A good quality of building paper should completely envelop the outside walls, fitting closely around all openings. Such a covering if well put on will more than repay the slight expense in any latitude, but the owner should watch this portion of the work with a vigilant eye, as there is no work so frequently slighted by the ordinary builder. Its purpose is to exclude cold and heat, and therefore it must cover every inch of surface. In northern climates the saving of fuel the first winter will usually repay the additional expense.

Clapboard.—The most serviceable and most satisfactory covering for the exterior is the old fashioned clapboard, sawed thinner at one edge than the other and each board overlapping the one below. If it checks or shrinks it will still let in less weather than the various drop and other fancy sidings. Because of its thinness it is made of a better quality of lumber and will hold paint better. To make a perfect job it should be put on with the old fashioned cut finishing nails, and they should be driven at least an inch above the lower edge.

A wide, steep water table cut from heart stuff should be provided, one rabbeted to permit the clapboard to set well down on it and projecting far enough to carry all water beyond the foundation. Such a water table should also be placed above every opening, unless tin flashing is used. (See Figure 14).

Windows.

Wide windows are always preferable to narrow ones, even though there be fewer of them. Great care should be exercised in placing the door and window cases to see that they fit snugly and leave no spaces for rain or drafts to enter the walls or rooms. The sash should be of the style known as check rail and glazed with double strength glass.

Storm Windows.—In the colder parts of the country double or storm windows should always be provided for winter use. The amount of fuel they will save and the additional comfort they will afford will amply repay for them. They can, of course, be provided at such time subsequent to building as convenience may dictate. For use in the country nothing has been found that answers every purpose so well as outside blinds. In preparing specifications wrought iron hinges should be indicated. They can be bought practically as cheap as cast iron, which they will outlast three to one. In exposed localities or where high winds are frequent, some form of fastenings to hold the blinds open, in addition to the usual catches on the hinge, will be required. A simple device is made to drive into the wall. It has a swivel end which stands upright by its own weight and holds the blind open except when turned to permit of closing. In windy localities these catches will save many hinges and possibly some glass.

The Veranda.—Good broad verandas are no longer regarded as luxuries, but as necessities. The old fashioned porch, too narrow to sit on and hemmed in by a close railing, was a farce and an aggravation, but a broad veranda, the roof supported by plain columns and with no railing, practically affords an additional room for summer use. Of course, if the floor of the veranda is far from the ground a light railing may be necessary to insure safety to children. Whether such a one is possible at first or not, at least so plan your house as to permit one later on.

The floor of the veranda should always be constructed of narrow, matched strips of heart wood, blind nailed, laid in white lead (the tongue of each strip heavily coated with white lead and oil before the next strip is driven on) and if possible, with not less than three good coats of paint. The ceiling may be of matched and beaded 3-inch stuff or left open to the roof. The former will, of course, give a much more finished appearance.

Painting.

This is an extremely important portion of the work of building the house, far more so than seems to be generally considered. Not only does the good appearance of the house depend very largely upon the painting, but its durability and comfort as well. The best siding manufactured will deteriorate rapidly if left unpainted, posts and pillars will crack and check, and warping and shrinkage will make entrances for wintry blasts. The work of painting can sometimes be done quite as well by the farmer himself, but too often he reserves too much to be done by himself, and months elapse before he succeeds in accomplishing this very necessary work.

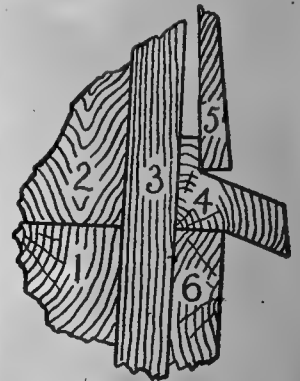


Figure 16.
Showing Water Table,
Etc. 1, sill; 2, studding;
3, sheathing; 4, water table;
5, siding; 6, outside base.

Purchase of Materials.—Whether he performs the labor himself or hires it on contract it will hardly pay him to purchase his own materials. There are some excellent ready mixed paints, but the very cheap grades are practically worthless. Seroco Paints, a brand now on the market, are undoubtedly the best and are much better than any the farmer could mix himself. It is the poorest kind of economy to slight this part of house building or to use inferior materials.

Seroco colors are absolutely pure and properly ground and mixed and the labor of applying will be no greater; the paint will go farther and last infinitely longer than where cheap, adulterated paints are used.

The Priming Coat.—The first or priming coat should be mixed very thin. A cheap ochre will answer every purpose for color and body. It should be worked well in and brushed out, as the painters put it, and allowed to dry thoroughly. The second coat should be somewhat thicker, of the proper color and smoothly laid on. The third coat should be still thicker, and should not be put on until the second coat is thoroughly dry and hard. In fact, it is best to wait six months before applying the final coat. If any cracks or checks have occurred it will fill them, or they may be puttied, and if the materials have been of the very best it will almost enamel the wood and leave it in condition to withstand all kinds of weather for years.

Color of Paint.—As to colors, light tints should always be chosen for country dwellings. The smoke and dirt which render them impractical, or at least expensive to maintain in the city, are not present in the country, and they give a house surrounded by green (as the farm house should be) a brighter, cheerier and cleaner appearance. A delicate pearl with light trimmings gives a durable covering and a neat combination. At all events avoid many of the brilliant colors. Bright blues, pinks, yellows, etc., are indicative of bad taste, and soon tire even to those who first advocated them. The custom, also, of combining a variety of colors—the house mainly of one color with a pink gable and a yellow foundation, and similar abominations—is to be severely condemned. A light blue makes a pretty veranda ceiling, and there its usefulness ends for house painting.

Interior Finish. The interior of the house should be almost free from paint. The kitchen floor, walls, and ceilings and the bathroom walls are the only places where it should be found. The woodwork should be sandpapered, and one coat of filler and one coat of hard oil applied.

The carpenter should straighten all walls and ceilings and place grounds or strips of the same thickness as it is intended to make the plaster to which to nail the interior finish before turning the job over to the lathers. Lathers should break joints at least every 18 inches, and should put on no laths vertically. Spaces between the laths should be $\frac{3}{8}$ inch to make the plaster hold properly.

Plastering.—The plasterer should use only the best clean sand and good unslaked lime and plenty of goat or cattle hair. He should allow several days for his plaster to thoroughly rot before applying. The first coat should be well scratched before it hardens, in order to provide for the second coat's holding. When the second coat is perfectly dry the third or skim coat should be put on very thin and should leave the wall smooth and white. The plasterer should make all angles and corners square and true and plumb and bring all his work exactly flush with grounds. He should further be required to return after all interior finish is completed and repair any injuries done by carpenters or other defects.

Hardware.—There is no item of expense connected with building for which the builder seems to pay so much and get so little as the hardware. Good hinges pay and so do good locks and knobs. Sash lifts on windows may be dispensed with when one is figuring close, and so, even, may window fastenings in bedrooms, kitchen, etc. A small hole bored through the lower sash and into the upper at their junction and a 6-penny wire nail inserted will serve as a temporary window catch and is one that no burglar can pick. If the purse will permit, slightly ornamental hardware on the front door and in the parlor will greatly add to the appearance of the house.

In dormers and wherever hinged windows are used some form of catch by which the windows can be fastened while open should be provided. Otherwise a sudden wind storm may result in considerable broken glass.

Whatever space there is between ceilings and roof should be capable of ventilation, to guard against uncomfortable upper rooms in hot weather.

A lean-to wood shed or a commodious back porch should always be provided. It may not be practicable to add it at the time of building, but it should be kept in mind and space provided for its ultimate erection.

Water.

A most important consideration in connection with every farm dwelling is the water supply. The ideal source is a free flowing spring, with stone or brick spring house, provided with tanks for milk cans, a safe for perishable food, etc., but such we cannot all have. Next comes a good well. A deep well with large windmill capable of pumping sufficient water for family and barn use is a great labor saver and most desirable in every way. Small gasoline and hot air engines are coming into use for pumping water, having, as they do, the merit that they will perform other work as well, such as sawing wood, grinding feed, etc. The farmer who contemplates putting in some power will do well to investigate their merits.

The most economical system to run and the most inexpensive to install is a small steam plant. This can be made to pump all necessary water, heat the house, and furnish power for sawing wood, grinding feed, cutting silage, etc.

The Tank.—A tank is almost everywhere a necessity with a windmill or engine, though the latter will require a smaller tank than the former, as it can be filled every day. The outside tub tank on its own tower, is much to be preferred to one in the house or in the windmill tower.

A system which has come into use quite recently consists of an airtight underground tank. A small hole in the pipe in the well admits some air, so that the tank is filled with compressed air and water, the compressed air serving to force the water to the second story of the house, the barn, etc. One we have seen in practical use consists of a condemned steam boiler with holes plugged. The water was always cool and never froze.

Cistern.—A good cistern is an adjunct never to be despised. The best form is of brick, with a brick partition through the center, through which the water must filter before it can reach the pump.

Bathroom.—No farm house should be regarded as complete until it contains a bathroom with stationary bathtub and a good kitchen sink. Both can be dispensed with at first, but so much do they add to the comfort and convenience that they should be supplied at the earliest opportunity. Even if there is no running water, they should be put in and waste pipes attached, thus saving an immense amount of tiresome work.



BARN AND OUTBUILDINGS.

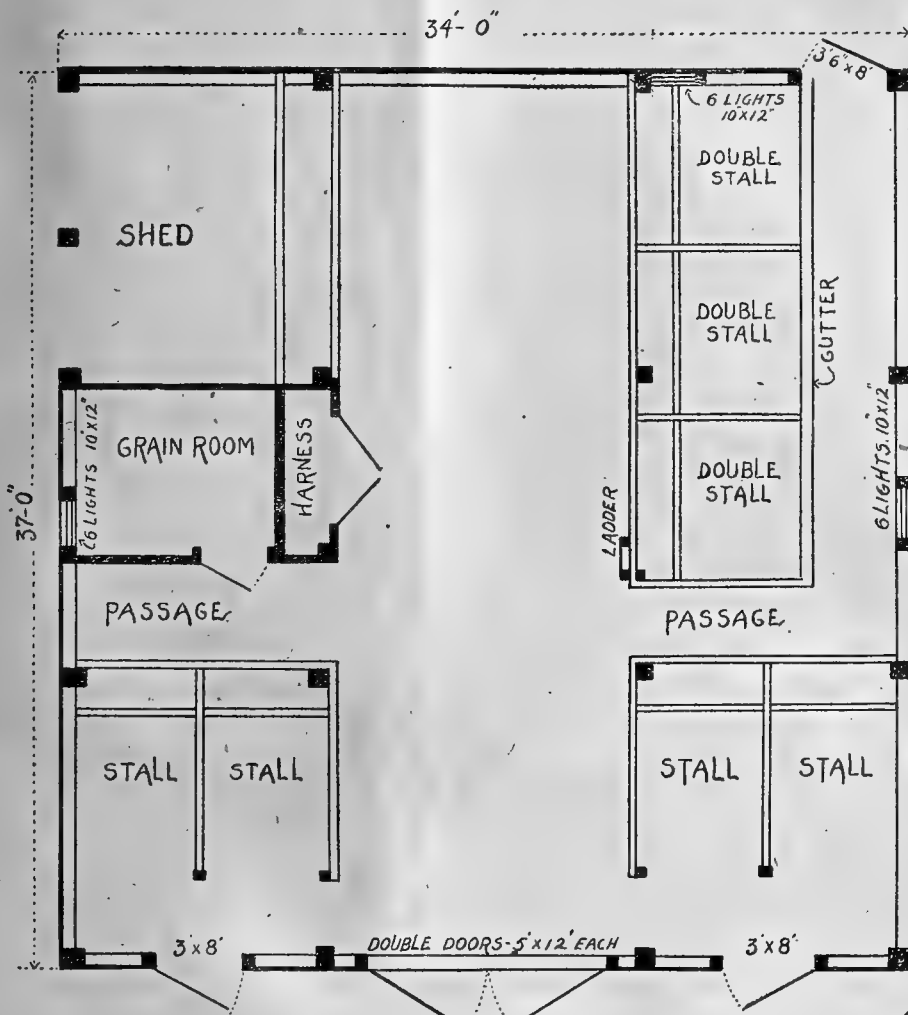


Figure 15.

Floor Plan of \$450.00 Barn. The location of the four bents are indicated by the large square posts.

being added to, is as applicable to barns as to dwellings.

If possible a scale drawing should be made, showing the ultimate development of the barn and the location of barnyard, pig pens, corn crib, poultry houses, etc. By working to such a plan mistakes will be avoided and much unnecessary work saved.

In considering the cost it should be remembered that in barn buildings, while the interior fixtures constitute a very important item of expense, they can be dispensed with to a very large extent for the time being.

The location of the barn and other farm buildings is, as heretofore stated, one that should receive due thought, even before the dwelling is erected. While it should not be sufficiently near the house to cause unpleasant odors or to endanger the one should the other take fire, it should be as close as possible and yet avoid these drawbacks. Anyone who has done farm chores in rough weather will appreciate the saving of discomfort by not having too long a distance to go from house to barn or, in fact, to any of the outbuildings. The questions of drainage, exposure, a suitable barnyard, and convenience to the water source should all be considered in locating the barn.

The idea heretofore advanced of building, to begin with, a small structure intended in time to become a portion of a larger, or capable of

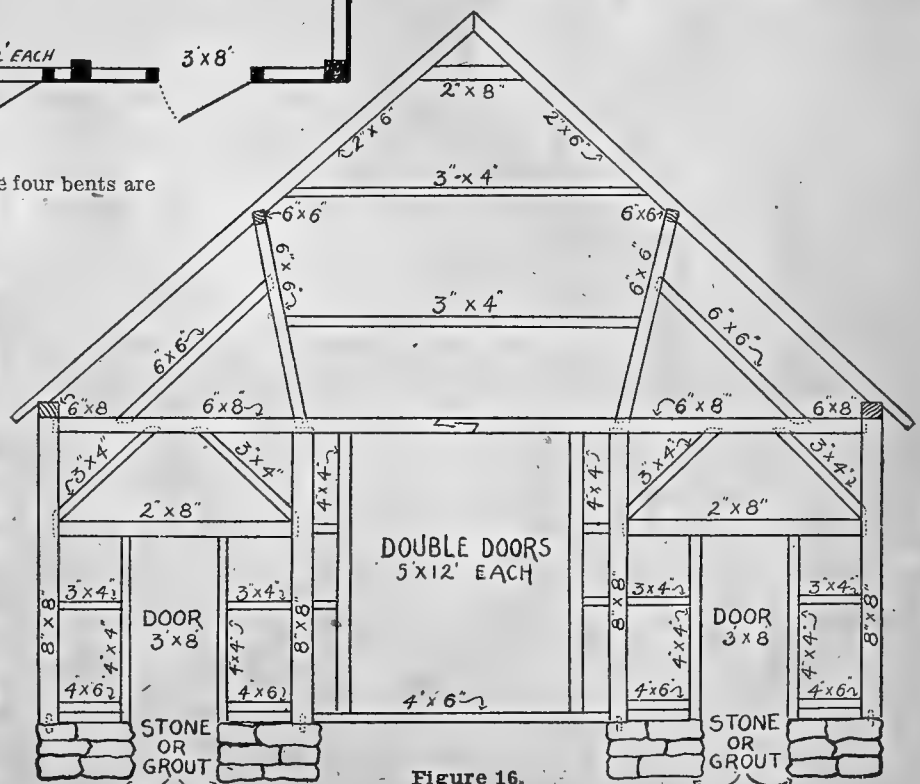


Figure 16.

Showing Construction of End Bents of \$450.00 Barn.

A substantial and solid frame, well covered, providing for a commodious structure, capable of housing an abundance of forage and a fair amount of stock, should be the first consideration.

Two Plans for Barns.

Designs for two barns are given, both small barns, and intended for the farmer who is making a start, or, at least, has but a small capital to expend. Both are susceptible to more or less enlargement, and both can be built for a very small outlay.

A \$600.00 Barn.—Barn No. 1 (Figures 15 to 21, inclusive) is 37 by 34 feet. The height is 12 feet at the eaves and 29½ feet to the peak. The loft is supported by sixteen 8 by 8 posts, if of sawed lumber, but round posts would serve as well, while the roof is again supported by eight 6 by 6 purline posts.

The first floor provides, as shown (Figure 15), for four horse stalls and three double cow stalls, while a shed with side open and intended to open into a small yard affords additional room for stock. A clear space, 12 by 37 feet, is left down the center, which would accommodate several vehicles and implements and leave room for a considerable amount of forage at the rear end. The loft would, as shown, accommodate, if well mowed away, from 20 to 25 tons of hay. The granary shown is 7½ by 8½ feet. In many instances this could be profitably cut down. The whole interior arrangement of the barn is intended to be merely suggestive. The frame will be found to be an excellent one, and one that can be built for very little money. The estimate, figured on a cost of lumber of \$24.00 per 1,000 feet, and including labor, with interior arrangements shown, flooring of loft, flooring of granary and double stalls, etc., places the cost at only \$608.37. The labor the farmer would perform himself would materially reduce this amount. Far simpler interior arrangements would answer. Rough posts could be

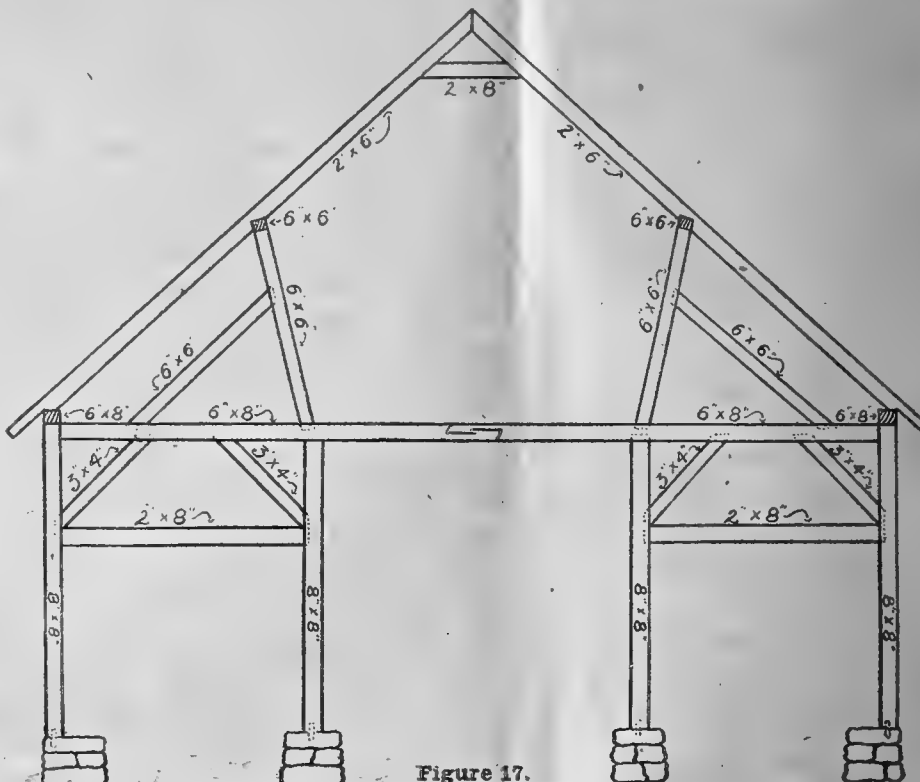


Figure 17. Showing Construction of Center Bents of \$450.00 Barn.

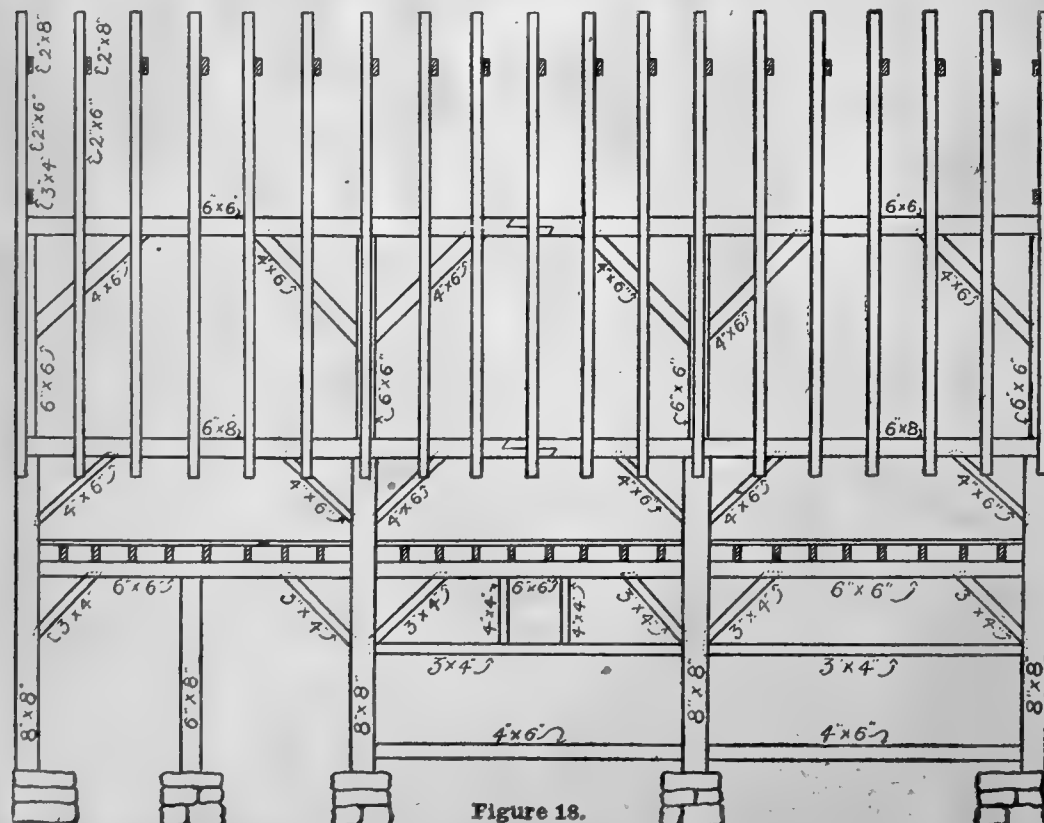


Figure 18. Side Elevation of \$450.00 Barn, Showing Left Side of Barn. The opposite side would differ only in that nailing girts would take the place of post in center of shed.

rough posts could be mowed away, from 20 to 25 tons of hay. The granary shown is 7½ by 8½ feet. In many instances this could be profitably cut down. The whole interior arrangement of the barn is intended to be merely suggestive. The frame will be found to be an excellent one, and one that can be built for very little money. The estimate, figured on a cost of lumber of \$24.00 per 1,000 feet, and including labor, with interior arrangements shown, flooring of loft, flooring of granary and double stalls, etc., places the cost at only \$608.37. The labor the farmer would perform himself would materially reduce this amount. Far simpler interior arrangements would answer. Rough posts could be

used instead of sawed timbers, etc. The cost given is for rough lumber throughout, except doors and door and window casings. Should it be desired to paint the barn, the additional cost of lumber dressed on one side can easily be ascertained and added. Cost of painting, two coats, would be about \$20.00.

For a time almost no interior fixtures would be essential. Stalls could be gradually built as increase in stock demanded and time and material permitted, etc.



Figure 19.

The design contemplates flooring the driveway at a height of 12 feet above the ground, and the side spaces over stalls, shed, etc., at a height of 8 feet. In the center a space 10 by 12 feet should be left for pitching hay, etc., into the loft. The arrangement of collar beams makes the installation of a hay fork very easy. More light could be secured in the loft by the addition of shuttered windows in the gable. The timbers should be mortised and pinned with hardwood pins, as shown. Figure 15 gives the floor plan, Figure 16 the end bents, and Figure 18 the side elevation. Figure 16 illustrates the splice to be used in joining the large timbers as indicated in the elevation, (1) being a pin,

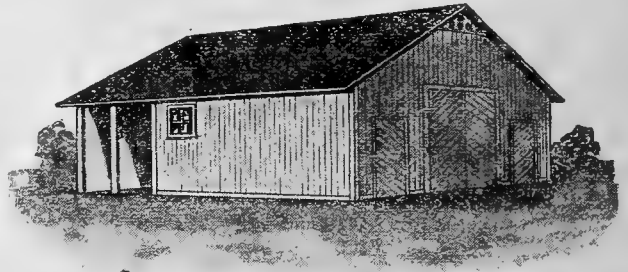


Figure 20.

which should be driven into space (a). Figure 20 shows the perspective view and Figure 21 the front elevation.

The two windows will give ample light to the cow stalls and a small window in the granary lights it. The narrow doors are built in two sections, so that the upper section can be thrown open and light and air let in. The arrangement given affords an opportunity for saving in labor, in that all the stock can be fed from the central floor.

Where the intention is to feed cattle or sheep the shed idea can be carried further and the entire left side of the barn can be left unsided, affording a shed 37 by 11 feet with feed racks along the inner side, which may be conveniently filled from the center space or loft as desired.



Figure 21.

In a word, this barn affords abundant room at small cost and is capable of an innumerable variety of interior arrangements.

BILL OF MATERIALS FOR BARN. Design No. 1.

Dimensions, 34x37 feet. Height at eaves, 12 feet; at center, 29½ feet.

16 pieces, 8x8 inches, 12 feet long,	1,024 feet B. M. for posts.
4 pieces, 6x8 inches, 20 feet long,	320 feet B. M. for plates.
8 pieces, 6x8 inches, 18 feet long,	576 feet B. M. for main girders.
4 pieces, 6x6 inches, 20 feet long,	240 feet B. M. for purline plates.
8 pieces, 6x6 inches, 18 feet long,	432 feet B. M. for purline posts and braces.
9 pieces, 4x6 inches, 12 feet long,	216 feet B. M. for purline post braces and plates.
1 piece, 6x8 inches, 8 feet long,	32 feet B. M. for post and shed.
4 pieces, 4x4 inches, 16 feet long,	85 feet B. M. for floor posts.
1 piece, 4x4 inches, 18 feet long,	24 feet B. M. for window posts.
9 pieces, 4x6 inches, 12 feet long,	216 feet B. M. for bottom girts.
1 piece, 4x6 inches, 16 feet long,	32 feet B. M. for bottom girder, front bent.
20 pieces, 3x4 inches, 16 feet long,	320 feet B. M. for braces and girders.
6 pieces, 8x8 inches, 12 feet long,	384 feet B. M. for bearers for inner ends of joists over stalls, etc.
6 pieces, 6x6 inches, 12 feet long,	216 feet B. M. for bearers for outer ends of joists over stalls, etc.
40 pieces, 2x6 inches, 25 feet long,	1,000 feet B. M. for rafters.

Bill of Materials for Barn, Design No. 1.—Continued.

- 80 pieces, 2x8 inches, 12 feet long, 1,280 feet B. M. for joists over stalls.
- 30 pieces, 2x8 inches, 13 feet long, 520 feet B. M. for joists over driveway.
- 6 pieces, 4x4 inches, 20 feet long, 160 feet B. M. for stall posts.
- 10 pieces, 2x4 inches, 18 feet long, 120 feet B. M. for inside studding.
- 1,600 sq. ft., 1x3 inches, 16 feet long, 1,600 feet B. M. for strips for roof sheathing.
- 191 sq. ft., 1x2 inches, 12 feet long, 191 feet B. M. for strips for battens.
- 1,500 sq. ft., 1x12 inches, 12 feet long, 1,500 feet B. M. for siding.
- 1,200 sq. ft., 1x12 inches, 16 feet long, 1,200 feet B. M. for siding gables.
- 1,000 sq. ft., 1x12 inches, 12 feet long, 1,000 feet B. M. for second floor.
- 350 sq. ft., 1x12 inches, 12 feet long, 350 feet B. M. for granary, etc.
- 150 sq. ft., 1x12 inches, 12 feet long, 150 feet B. M. for double stall floors.
- 650 sq. ft., 1x12 inches, 12 feet long, 650 feet B. M. for stalls, partitions, etc.

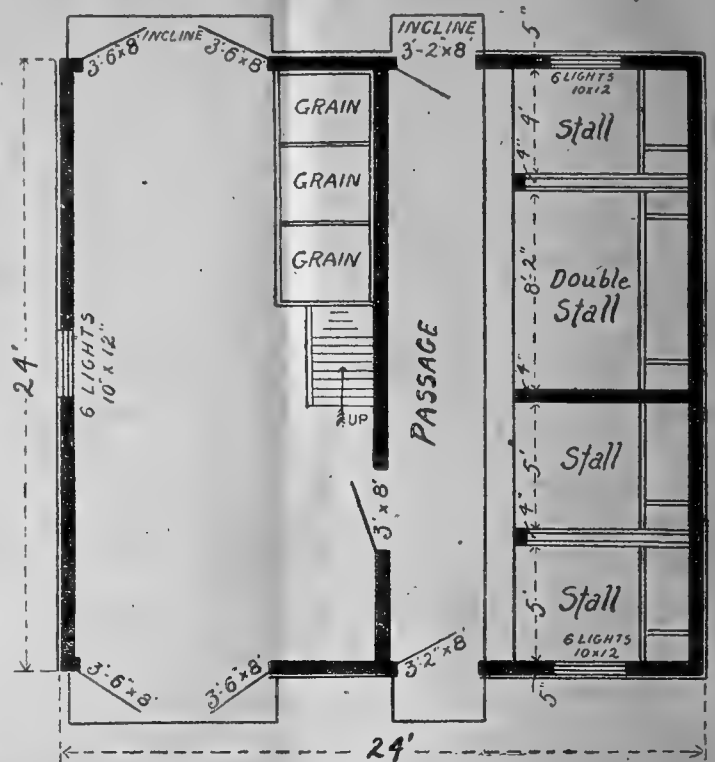


Figure 22.
Floor Plan of \$425.00 Barn.

Total 13,838 feet, at \$24.00 per M. \$332.11

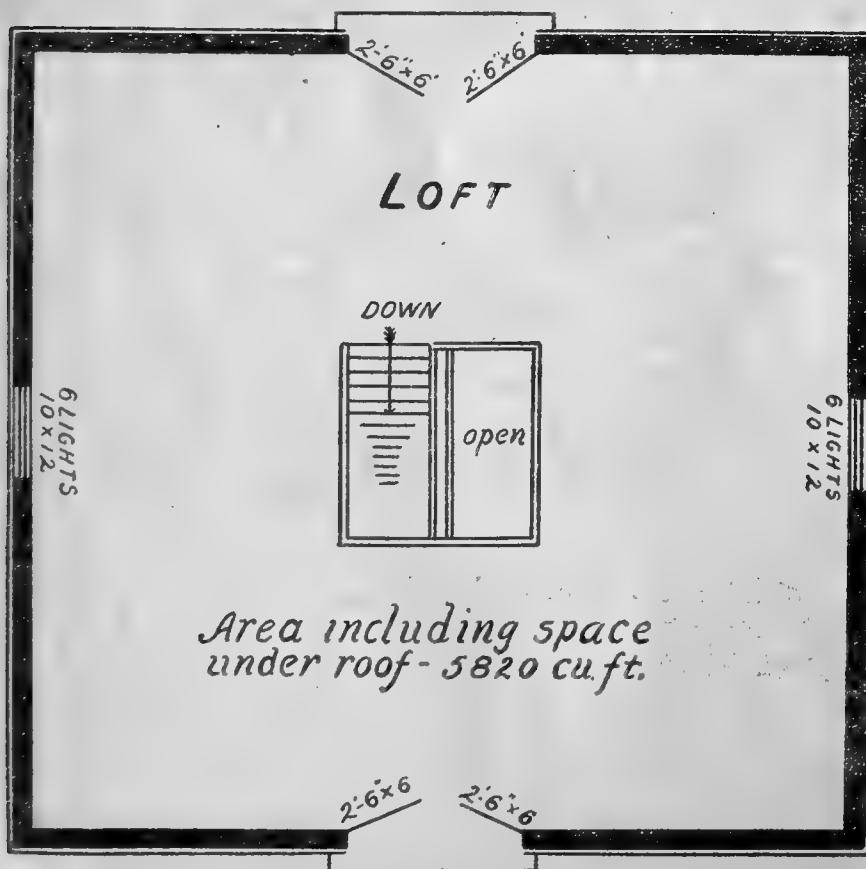


Figure 23. Loft Plan of \$425.00 Barn

- 250 square feet flooring, 7/8x3 1/2 inches, for doors. 5.75
- 12 pieces, 1x6 inches, 12 feet long, dressed two sides, for battens. 1.92
- 11 pieces, 1 1/2x5 in. 8 ft. 6 in. long; 2 pieces, 1 1/2x5 in., 12 ft. 6 in. long; 1 piece, 1 1/2x5 in., 8 ft. long; 7 pieces, 7/8x4 in., 16 ft. long; 2 pieces, 7/8x4 in., 12 ft. long; 1 piece, 7/8x4 in., 10 ft. long; 2 pieces, 7/8x5 in., 12 ft. long; 2 pieces, 7/8x4 in., 12 ft. long; 1 piece, 1 3/4x8 in., 12 ft. long, dressed two sides, for inside finish. 5.00
- 10,000 cypress heart shingles, 5x20 inches, at \$6.50 per M. 65.00
- 2 sash, 6 lights, glass 10x12 inches. 1.60
- 1 sash, 4 lights, glass 10x12 inches. .40
- Hardware, including 200 lbs. 10-penny nails, 100 lbs. 20-penny nails, 50 lbs. 8-penny nails, 75 lbs. 5-penny nails, 11 pairs 14-inch strap hinges 15.40
- Carpenter work 180.00
- Total \$607.18

A \$425.00 Barn.—Design No. 2 (Figures 22, 23, 24, 25, 26, 27 and 28) provides for a barn 24 by 24 feet and 16 feet high at the eaves. It is divided into stable and wagon and carriage room. The stable

affords room for three head of cattle and two horses. The cost of this barn, figured on the same basis as design No. 1, and including interior arrangements and flooring of second floor and under stalls, is estimated at \$423.53. The interior fixtures are, of course, capable of any arrangement that will suit the needs of the individual owner. The loft will hold, approximately, 10 tons of hay.

The design admits of the erection of sheds on each side of the main building, which would increase the capacity of the barn to fifteen head of stock, or more; and were an outside silo provided, the lack of loft room would not be serious.

If the farmer does not fear the effect of throwing down hay or fodder at the heads of his stock, it might be well to move the staircase in this design to the extreme front, close the opening, as shown in the second floor, and provide openings immediately over the mangers. Such an arrangement would be somewhat more economical of space and save the second handling of long feed.

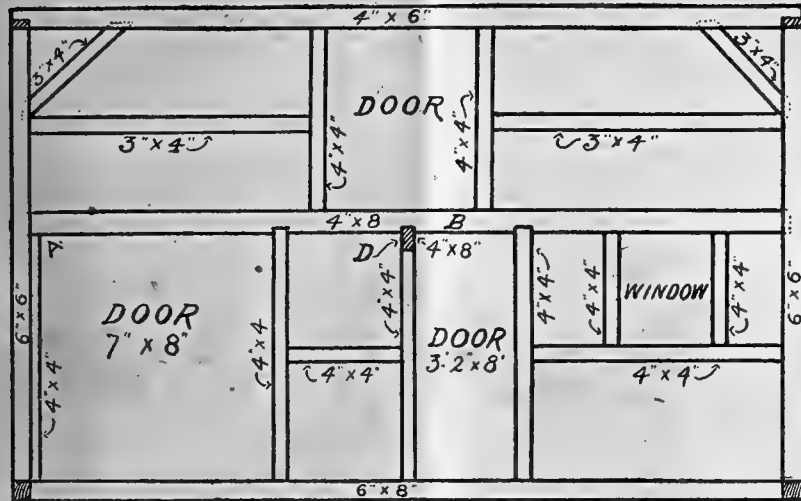


Figure 24.
Construction of Ends of \$425.00 Barn.

of throwing down hay or fodder at the heads of his stock, it might be well to move the staircase in this design to the extreme front, close the opening, as shown in the second floor, and provide openings immediately over the mangers. Such an arrangement would be somewhat more economical of space and save the second handling of long feed.

Cost of Materials.—Bills of materials are given for both of these designs, including the materials necessary for the interior fixtures shown. Of course, should it be desired to

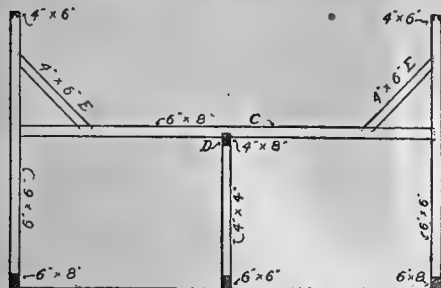


Figure 26.
Construction of Two Inside Bents of \$425.00 Barn.

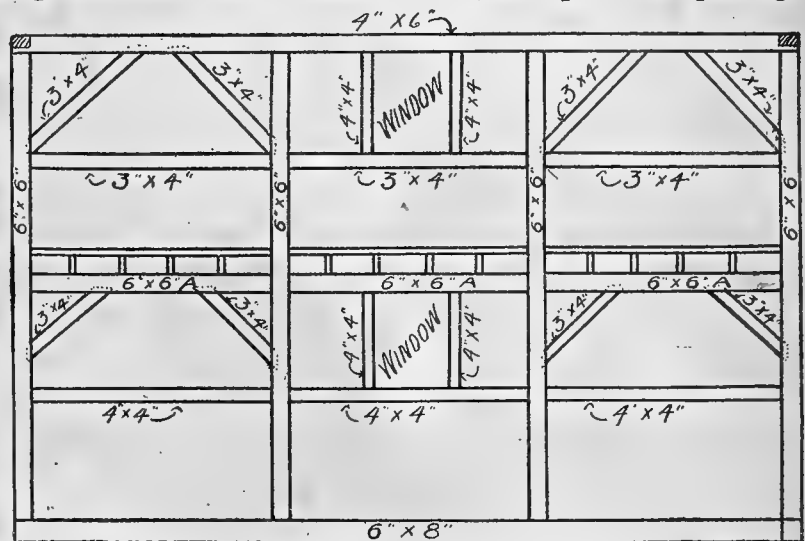


Figure 25. Construction of Sides of \$425.00 Barn.

change these arrangements the bills of materials should be altered accordingly.

No cupolas are provided for in either of these designs. Ample ventilation can be secured by leaving the rafters unboxed, and cupolas serve mainly to increase the expense.

BILL OF MATERIALS FOR BARN.

Design No. 2.

Dimensions, 24x24 feet. Walls, 16 feet.

- 4 pieces, 6 x 8 inches, 24 feet long, 384 feet B. M. for main sills.
- 1 piece, 6 x 6 inches, 24 feet long, 72 feet B. M. for inside sills.
- 8 pieces, 6 x 6 inches, 16 feet long, 384 feet B. M. for posts.
- 3 pieces, 6 x 6 inches, 16 feet long, 144 feet B. M. for joist bearers, A.
- 2 pieces, 4 x 8 inches, 24 feet long, 128 feet B. M. for girders, B.
- 2 pieces, 6 x 8 inches, 24 feet long, 192 feet B. M. for center girders, C.

Bill of Materials for Barn, Design No. 2.—Continued.

4 pieces, 4 x 6 inches, 24 feet long,	192 feet B. M. for plates.	
1 piece, 4 x 8 inches, 24 feet long,	65 feet B. M. for center joist bearer, D.	
7 pieces, 4 x 4 inches, 16 feet long,	150 feet B. M. for outside girders, posts, etc.	
2 pieces, 4 x 4 inches, 12 feet long,	32 feet B. M. for posts, outside girders, etc.	
3 pieces, 4 x 4 inches, 18 feet long,	72 feet B. M. for outside girders, posts, etc.	
9 pieces, 3 x 4 inches, 16 feet long,	144 feet B. M. for braces, etc.	
2 pieces, 3 x 4 inches, 18 feet long,	36 feet B. M. for braces, etc.	
1 piece, 3 x 4 inches, 12 feet long,	12 feet B. M. for braces, etc.	
1 piece, 4 x 8 inches, 16 feet long,	43 feet B. M. for header for stairway.	
2 pieces, 4 x 6 inches, 12 feet long,	48 feet B. M. for long braces, EE.	
4 pieces, 2 x 8 inches, 24 feet long,	128 feet B. M. for hip rafters.	
26 pieces, 2 x 6 inches, 18 feet long,	468 feet B. M. for hip rafters.	
2 pieces, 2 x 8 inches, 12 feet long,	32 feet B. M. for valley rafters.	
10 pieces, 2 x 8 inches, 24 feet long,	320 feet B. M. for second floor joists.	
5 pieces, 2 x 8 inches, 18 feet long,	120 feet B. M. for second floor joists.	
200 pieces, 1 x 3 inches, 16 feet long,	800 feet B. M. for roof sheathing.	
2 pieces, 6 x 6 inches, 18 feet long,	108 feet B. M. for center posts.	
10 pieces, 2 x 4 inches, 18 feet long,	120 feet B. M. for center studding.	
2 pieces, 2 x 10 inches, 16 feet long,	53 feet B. M. for stair horses.	
100 pieces, 1 x 12 inches, 16 feet long,	1,600 feet B. M. for siding and partitions.	
100 pieces, 1 x 2 inches, 16 feet long,	267 feet B. M. for battens.	
7 pieces, 1 x 4 inches, 16 feet long,	38 feet B. M. for fascia.	
3 pieces, 1½ x 12 inches, 16 feet long,	60 feet B. M. for stair steps.	
Total	6,211 feet, at \$24.00 per M.	\$149.07
270 square feet flooring, 7/8 x 3½ inches, for doors		6.21
11 pieces, 1x6 inches, 16 feet long, dressed two sides, for battens for doors		1.76
633 square feet flooring, 7/8 x 3½ inches, for second floor		14.56
325 square feet flooring, 7/8 x 3½ inches, for grain bins		7.48
2 pieces, 2x8 inches, 16 feet long, dressed two sides, for sills for doors and windows .....		.90
8 pieces, 1½ x 5 inches, 16 feet long, dressed two sides, for door jambs		4.00
3 pieces, 1x4 inches, 16 feet long, dressed one side, for window casings .....		.32
5 rim sash, 6 lights, glass 10x12 inches		4.00
Tin flashings for valleys		2.50
7,250 cypress heart shingles, 5x20 inches, at \$6.50 per M.		47.13
Hardware, including 50 pounds 4-penny shingle nails, 100 pounds 20-penny wire nails, 100 pounds 10-penny wire nails, 100 pounds 8-penny wire nails, 15 pairs 14-inch strap hinges.		10.85
Carpenter work		100.00
Total		\$348.78

This bill of materials provides for building the barn of rough boards figured at \$24.00 per 1,000 board feet. If it is desired to paint the barn it will be necessary to figure on siding dressed one side and battens dressed three sides. The painting at prevailing prices would cost for two coats about \$25.00.

Possible Improvements.—Floors, stalls, harness rooms, granary, and all solid partitions can come later, and as time and pocketbook permit. Temporarily a few pine poles, saplings or fence rails will serve to make the necessary partitions, in conjunction with the timbers of the frame. An earth floor in a dry, well drained location, while it may occasion some extra labor to keep clean and level, will be found fairly satisfactory. While stanchions may prove a convenience, a rope halter and a ring or cleat on the wall will hold most milch cows, etc. In a word, it is always a wise plan to put up as commodious and comfortable a building as possible at the start, even though it may be necessary to wait for extra conveniences until one, perhaps several, crops are raised.

Bank Barns.—In many locations the ground will be found to adapt itself to the building of a bank barn, and although there have been many objections raised against this style of barn, we believe that the objectionable features can be provided against, and that when the lay of the land lends itself to such a structure none more convenient nor comfortable can be adopted.

The chief objection to the bank barn lies in the fact that it necessitates a basement stable, one that it is claimed will prove dark, damp, and generally unhealthy. But these conditions are by no means essential. The ideal location is a hillside sloping to the south. In such a location the rising land, to the north and the fact that the north wall is below the surface both serve to protect the stabling from the cold. The southern exposure of the stable, which should be provided with ample doors, admits an abundance of sunshine, and if low windows, such as are commonly known as cellar sash, be placed just below the ceiling on each side, they will afford satisfactory means of lighting and ventilation. In storing forage, teams can be driven in on the main floor without climbing a steep ascent and hay and fodder put away on the same floor and with a minimum of labor. In too many instances the basements of bank

and other basement barns have been placed too deep in the ground, and when so placed all the objections advanced against them are well sustained. The basement should be so placed as to permit of side windows at least two-thirds of the way back. In building bank barns it is usual to construct the portion of the walls below the surface of stone or brick, but wooden walls coated with hot tar, with tarred felt nailed over it, have proved extremely durable.

Barn Frames.—Barn frames may be varied to an almost indefinite extent. In sections where timber is plentiful, natural undressed posts, tied together with sized stuff bolted into place, will generally prove the most economical for the ordinary farm barn. The girders are let slightly into the surfaces of the posts and all siding is nailed to the girders.

Plates like the girders will need to be of sized timbers, and so will the rafters. When timber is scarce and all lumber has to be purchased from dealers, the system already referred to in connection with dwelling frames, of building up timbers of several pieces of plank, will usually be found to be more economical, both in labor and money, than the use of single heavy timbers, and a strong frame will be so obtained. In barns of any considerable size provision should be made for the use of a hay fork even if the purchase of the outfit seems remote. A little care in planning will save considerable expense and trouble in remodeling when the time does come to install one.

Quarters for the Cows.—In the arrangement the sunniest, warmest corner should be apportioned to the milch cows. The winter sun will prove a grateful tonic to them and protection from severe cold or wintry blasts will prove a valuable assistance and money saver. Many dairy farmers build their stable walls double with chaff between, but such walls have several serious disadvantages. Inflammability



Figure 27.
Front Elevation of \$450.00 Barn.

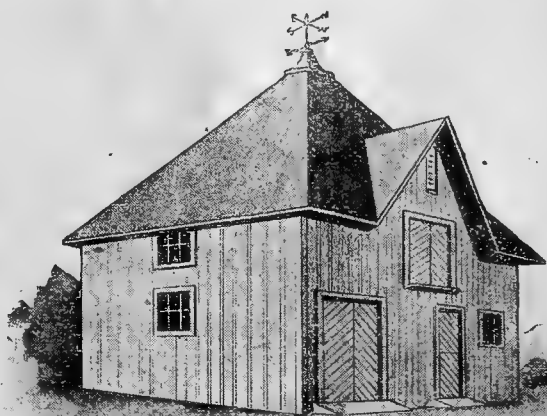


Figure 28.
Showing Perspective View of \$425.00 Barn.

is not the least; infection by vermin, disease germs, and the difficulty of disinfection in case of the latter, all operate against such walls, warm though they may be. Double boarding with a good quality of building paper between them, and all cracks carefully battened on the outside will, we believe, prove much more advantageous. Above the stable single boarding with cracks well battened will prove sufficient.

Stable Floor.—Undoubtedly the most convenient floor for a stable is cement. The ideal floor is made of cement with movable plank floors for the stalls. In localities where the soil is of a clayey nature soil will make a very satisfactory floor if the stalls are floored with plank and plank gutters are provided for the manure. Such a floor makes an excellent temporary arrangement, and cement can be purchased and laid as time and funds will permit.

When hay, etc., is to be stored above the stock, as is very frequently the case, a tight second floor of matched lumber should be provided to prevent seeds and chaff from sifting down, and in any event such a floor will go a long way toward conserving warmth in a stable.

Light in the Stable.—While it pays to provide for plenty of light in the stables, some means should be provided for excluding light in fly season. Light frames made of lath and covered with coarse brown paper will serve the purpose well, while curtains for the doors, made of old gunny sacks, will exclude light and admit air and will brush off the majority of flies as the cattle enter.

Sanitary Arrangements.—The subject of farm buildings can hardly be considered closed without some reference to the subject of sanitation, particularly as it concerns the disposal of sewage.

The farm house which is supplied with abundant water, either running or so stored as to give a sufficient force, can easily be further provided with a flush out water closet and a sewer constructed of vitrified sewer pipe of sufficient length to carry sewage beyond the possibility of land or water contamination. But the farm dwelling with these advantages is, unfortunately, the exception rather than the rule, and therefore some other means for sewage disposal must be provided.

The most common form, and, when properly constructed, probably the cheapest and best, is the privy. As commonly constructed, with a vault of more or less depth, this useful contrivance is not only extremely obnoxious, but is a menace to health. The supposition that because the privy stands on slightly lower ground than the top of the well, and that because the well cannot become infected by surface drainage there is no danger to be apprehended from the privy, is all too common. It is practically impossible to judge by the surface of the ground of the various strata of soil below, some of them being capable of conveying sewage contamination several hundred feet. The very fact that the liquid in a privy vault seeps away is sufficient evidence that it has struck some porous strata and is going somewhere, and the frequent cases of typhoid and diphtheria on what should be thoroughly healthful farms are ample proof that it too frequently finds its way to the source of drinking water. Another fact that should not be lost sight of is that wells are usually fed by underground courses, and one of these may pass directly beneath the privy vault.

The cleanest, safest, and in every way least objectionable privy is the form known as earth closet. In such a one a quantity of fine, dry earth is kept handy for constant use, while beneath is a receptacle for the excreta. Every time the privy is used a small quantity of earth is emptied into this receptacle, and at frequent intervals the night soil, made as little offensive as possible by the admixture of dry earth, is hauled away, to be applied to some portion of the farm where there can be no possible danger of infecting the water supply.

The most convenient form of receptacle is a stout box provided with runners and a hook, to which can be attached a singletree. With such an arrangement it requires but a few minutes' work, when through plowing or cultivating, to hook on a horse, drive to the proper place, invert the box and drive it back again empty.

Care must also be taken that the drainage of the barnyard shall not reach the drinking water.

CONSTRUCTION OF GOOD COUNTRY ROADS.

Introduction.

As "the road is a type of civilized society," it becomes the duty of every enlightened nation to solve the great questions of road construction and maintenance to its own satisfaction and good. Rome's greatness marked an era in road construction which was never before surpassed, and which has been equaled only in the present century and in the most civilized countries.

The condition of the public roads in the United States is probably worse than in any other civilized country in the world. This condition is due largely not only to the undeveloped condition of the country and to the allowance of local circumstances to determine location, etc., but to the lack of knowledge on the part of many road officials as to the primary principles of road construction, resulting in the injudicious use of millions of dollars of the public money annually.

Quoting an eminent authority: "The increased cost of haulage actually done is by no means the only loss resulting from bad roads. The loss of perishable products for want of access to the market, the failure to reach markets when the prices are good, and the failure to cultivate products which would be marketable if the markets were always accessible, add many millions to the tax of bad roads," not to speak of the detriment to social communication, education and religion. In fact the movement for good roads deeply concerns every commercial, financial, and social interest in the land. "We are handicapped in all the markets of the world by an enormous waste of labor in the primary transportation of our products and manufactures, while our home markets are restricted by difficulties in rural distribution which not infrequently clog all the channels of transportation, trade, and finance."

Present Work to be Conducted with a View to Future Improvement.—All the important roads in the United States can be and probably will be macadamized or otherwise improved in the not distant future. This expectation should govern the present management of roads everywhere; no labor or expense should be expended upon them other than that which leads to their ultimate improvement as hard roads.

Many roads of this country were originally laid out without any attention to general topography, and in most cases followed the settler's path from cabin to cabin, the pig's trail from his favorite nut producing trees to his wallow in the mud and water of the swamps, or the boundary lines of farms, regardless of grades or direction. Most of them remain today where they were originally located, and where untold energy, expense and labor have been wasted in trying to haul over them and in endeavoring to improve their deplorable condition. It is a great error to continue to follow these primitive paths with public highways. The proper thing to do is to call in a good road engineer and have the location so changed as to throw the roads around the ends or along the sides of the steep hills and ridges instead of continuing to go over them, or in raising the roads up on dry solid ground, instead of splashing through the mud and water of the bayous and creeks in the lowlands.

Location.

If a road goes over a hill when it might go around, the labor and expense put upon it are absolutely wasted, and the sooner its direction is changed the better. If a road is not rounded up and surface drained, it should be, not only for present use as an earth road, but as a preliminary to macadamizing. If it is not underdrained in all wet spots this should be the first work done. Nothing, indeed, will pay better for present use than putting in tile or stone drains.

Grades.

Good roads should wind around hills instead of running over them; and in many cases this would not increase their length, as it is no farther around some hills than over them. Moreover, as a general rule, the horizontal length of a road may be advantageously increased, to avoid any ascent, by at least twenty times the perpendicular height thus saved; for instance, to escape a hill 100 feet high it would be better for the road to make such a circuit as would increase its length 2,000 feet. The reasons for this are manifold, the principal one being that a horse can pull only four-fifths as much on a grade of 2 feet in 100, and gradually less as the grade increases until with a grade of 10 feet in 100 he can draw but one-fourth as much as he can on a level road.

As a chain is no stronger than its weakest link, just so the greatest load which can be hauled over a road is the load which can be hauled up the steepest hill on the road. The cost of haulage is therefore necessarily increased in proportion to the grade, as it costs one and one-half times as much to haul over a road having a 5 per cent grade, and three times as much over one having a 10 per cent grade as on a level road. As a perfectly level road can seldom be had, it is well to know the steepest allowable grade. If the hill be one of great length, it is best to have the lowest part steepest, upon which the horse is capable of exerting its full strength, and to make the slope more gentle toward the summit to correspond with the continually decreasing strength of the fatigued animal.

It has been estimated that a horse can pull better where the road is slightly undulating; say, where it has a level stretch, then a slight grade not steeper than 1 foot in 125 feet, and following this a decline of the same steepness, etc. In this way three different sets of muscles are brought into action, and while the one is being used the other is being rested. It is hardly necessary to recommend the construction of roads according to this principle at present, as we are a long way from even comparatively level ones. That the principle is a true one, however, is proved by the fact that a bicyclist finds it easier and more restful to ride over slightly undulating roads than over absolutely level ones.

All things being considered, the horizontal grade of a road should never be greater than 3 feet to the 100, nor less than 1 foot in 125 feet.

Drainage.

Inasmuch as all things are governed by nature's laws, and nothing by chance, we can only expect to secure economy by a strict observation and application of those principles which act in perfect harmony with that law. Water will not flow uphill, neither will it flow into ditches made for it to flow into; on the contrary, water flows in that direction where the least resistance to the laws of gravity exists; if that is down the middle of the road then you will find after each heavy rain the telltale gully. Water being the greatest enemy of the road, it should flow freely off the surface. This is accomplished by preparing the bed so that there may be a fall from the center to the sides of 6 inches, never exceeding 9 inches, on a road 30 feet wide; for a road 18 to 20 feet wide, from 3 to 4 inches is enough. A ditch should be constructed on either side of the road to carry away easily and quickly all water from the road and vicinity. These ditches should have a continuous fall throughout their entire length, and their size should depend upon the amount of water they are expected to carry. Water should never be allowed to flow across a roadway; culverts, tile drains, or, if nothing better can be had, a hollow log should be provided for that purpose.

In order to have good roads, it is just as necessary that water should not be allowed to attack the substructure from below as that it should not be permitted to percolate through it from above. Especially is the former provision essential in cold climates, where, if water is allowed to remain in the substructure, the whole roadway is liable to be broken up by frosts or destroyed by the wheels of vehicles. Where roads run over low, wet lands or over certain kinds of clayey soils, surface drainage is not all that is necessary.

Underdrains are easily and cheaply made, and when properly constructed with the best tools and materials available, will last for ages. They should be about 4 feet deep and carefully graded at the bottom so as to have a fall throughout their entire length of at least 6 inches for each 100 feet in length. Tile drains should be used if possible, but if they cannot be secured, large, flat stones can be carefully placed so as to form an open channel at the bottom. Slim fagots of wood or brush bound together in bundles and laid lengthwise at the bottom will answer fairly well. The ditch should then be filled with field stones, small stones or gravel, or, if none of these can be had, with soil. The drains should be protected by straw, sod, or brush, so as to prevent the soil from washing in and clogging them.

The Surface of Roads.

A great difference in roads lies in the nature of their surface. On a well made gravel road one horse can draw twice as much as he can on a well made earth road, while on a hard and smooth stone road he can pull four times as much. Consequently, where we have good gravel roads, instead of earth ones, it is possible to make one horse do the work of two, while on stone roads one horse will do the work of four. On a level steel road one horse can do the work of twenty or more horses over a level common road.

After a road has been properly located, graded and drained, the important qualities of hardness and smoothness should by all means be secured. The various surfaces for good country roads will be considered in the following order: Earth, gravel, and stone.

Earth Roads.—For earth roads, as commonly built, there is little to be said. They should be tolerated only in a new country or where there is absolutely nothing but earth of which to make them. Yet, with earth alone, a passable road can be made and maintained, if sufficient care is taken to have it thoroughly rolled and drained and the surface kept in proper condition.

Whenever the subgrade soil is found unsuitable, it should be removed and replaced with good material rolled to a bearing. On the prepared subgrade the earth should be spread, harrowed, if necessary and then rolled to a bearing.

With narrow roads, enough material may be excavated to raise the roadway above the subgrade in forming the side ditches by means of road machines. If material cannot be secured as indicated, the required earth should be obtained by widening the excavations, or from cuttings on the line of the new roadway, or from borrow pits close by. When the earth is brought up to the final height it is again harrowed, then trimmed by means of road levelers or road machines, and ultimately rolled to a hard and smooth surface.

Gravel Roads.—Where good packing gravel is easily obtained, a satisfactory road can be made by covering the prepared surface for a greater or less depth with this material. Blue gravel or hardpan and clean bank gravel, when properly mixed and placed, give a surface almost like concrete in hardness.

The most excellent gravel for road building stands perpendicular in the bank, compact and firm, and cannot be dislodged except by use of the pick, and when it is dislodged falls in great, solid chunks. Such material contains just enough cementing properties to enable it to readily pack and consolidate, and when properly placed on the prepared roadbed makes a surface which possesses most all the qualities of a good stone road. Rounded or water worn gravel should never be used for the surfacing of roads, as such gravels remain loose and shifting, like materials in a shaken sieve. For the wearing surface gravel should be comparatively clean, hard, angular and tough. Such gravel is easily consolidated, and will not readily pulverize into dust and mud.

The foundations for stone and gravel roads are too often neglected. It is well to remember that without a durable foundation there is no durable road. The cross section of the foundation should conform to that of the finished road, and should be so thoroughly rolled that wagons passing over it make no perceptible impression.

A layer of gravel, no less than 4 inches nor more than 6 inches in thickness, should then be spread on, sprinkled thoroughly, and rolled until very compact and firm. Next, spread another layer of the best gravel available over the surface to a depth of not exceeding 4 inches. All inequalities, together with stone and gravels exceeding $\frac{3}{4}$ inch in diameter, should then be raked out. It is again sprinkled and rolled until the desired hardness and smoothness are obtained. The roller is doubtless the most important piece of machinery connected with the building and maintaining of roads, and it is well to remember that it cannot be used too often, especially in the spring when the frosts and rains are so destructive.

Stone Roads.—The advantages to be derived from good stone roads are so manifold that all other material should be discarded where tough stone road is available for their construction and maintenance. But it is a greater economy to use earth and gravel than to go to the expense of macadamizing roads with too soft, too brittle, or rotten material. Many use this because it is more easily prepared. A road should never be surfaced with anything short of trap rock or serpentine. Inferior material may often be used with impunity for the first layer or foundation, but even this should be selected with great care.

The evils resulting from improper construction of stone roads are even greater than those from improper material. John L. Macadam never intended that heterogenous conglomerations of stone and mud should be called a macadam road. Neither did he intend that the name should be applied to roads constructed of large and small stones, which work to the surface, and which are knocked hither and thither by the wheels of vehicles and the feet of animals. Such methods of construction cannot be too severely condemned.

Broken stone roads may be properly divided into two classes—macadam and telford. The principal difference between these two constructions is as to the propriety or necessity of a paved foundation beneath the coating of broken stone. Macadam denied the advantage of this, while Telford supported and practiced it. This point will not be argued here, but it is suggested that good judgment should be used

Proper Construction of Roads.

in the selection of one or the other of these two systems. The macadam system is the best under some conditions, while the telford is more advantageous under others. The latter system seems to have the advantage in swampy, wet places, or where the soil is in strata varying in hardness, or where the foundation is liable to get soft in spots. Under most other circumstances experienced road builders prefer the macadam construction.

The earth foundation for either system is identical. It should have the same slopes from center to sides as the finished road, with sufficient shouldering to hold the stone in place at the sides. All vegetable matter should be removed and the earth made perfectly smooth and of uniform quality. It should then be thoroughly rolled until hard and dry.

Macadam.—The first course of foundation of the macadam road can be made of the coarsest stones from the crusher, provided that they are of uniform size, and that each stone shall weigh not over 6 ounces, and will pass through a 2½-inch ring. Where the road is to be 8 inches thick this foundation should be 4 inches after rolling. If the road is to be of greater thickness than 8 inches, the foundation should be composed of two courses, separately rolled.

After having thoroughly rolled this foundation apply enough ground stone or coarse sand to fill the interstices. This should be wetted and thoroughly rolled until a hard and uniform surface is obtained. Upon this foundation the surface material should be placed, wetted and thoroughly rolled. The stones of which this surface material is composed should be, if possible, crushed to a size of 1 inch in diameter, but if that is not possible they should never be larger in diameter than 1½ inches. Ground stone screenings should then be spread upon the surface, wetted and rolled as before, until a hard, smooth surface is obtained.

Telford.—The telford foundation is composed of stones of various sizes, not exceeding 10 inches in length and 6 inches in breadth on the broadest side, nor 3 inches in thickness on the narrow side. These stones are placed lengthwise across the road, breaking joints as near as possible; the interstices are filled with stone chips, all projecting points are broken off, and the whole structure is wedged, consolidated, and made as firm as possible.

In case the finished road is to be 10 inches in thickness, this foundation should not exceed 6 inches in depth. If large stones are used, so as to necessitate a greater thickness than 6 inches, there should always be an allowance made for a 4-inch broken stone surface.

This foundation should be covered with coarse sand or stone screenings, or if neither of these can be obtained, fine loam may be used, so that all voids may be filled and the whole brought to a hard and uniform surface by thoroughly rolling. A layer of broken stone is then added and treated as in the macadam system. Where the funds will permit and the traffic requires it, a regular two-course macadam surface may be placed upon the telford foundation with good result.

Without proper care the most expensive road may go to ruin in two or three years, and the initial expense of constructing it be nearly lost. It is of greatest importance, therefore, that all good roads should have daily care. They not only wear out but wash out and freeze out. Water is the greatest road destroyer.

It is necessary to the proper maintenance of a road that it should crown or be higher in the middle than at the sides. If it is flat in the center it soon becomes concave, and its middle becomes a pool or mud hole if on a level, or a water course if on an incline.

A hollow rut or puddle should never be allowed to remain, but should be evenly filled and tamped with the same material of which the surface was originally constructed. A rake should be used freely, especially in removing stones, lumps, or ridges. Ruts may be avoided by using wide tires on all wagons which carry heavy loads. If this is not always possible the horses should be hitched so that they will walk directly in front of the wheels. A horse will not walk in a rut unless compelled to do so, and, consequently, if all horses were hitched in this way ruts would eventually disappear from stone roads.

If stones are cracked on a road with a hammer a smooth surface is out of the question. Use stone chips for repairing stone roads, and remember that all foreign material and rubbish will ruin the best road, and that dust and mud will double the cost of maintenance.

Ordinarily the chief work done by country people on highways is repairing the damage resulting from neglect. Why this negligence? The adage, "A stitch in time saves nine," can never be applied more appropriately than to the maintenance and repair of all kinds of roads.

Conclusion.

The foregoing comprises the general principle of road construction and maintenance, in conformity with which the art of road making depends essentially for its success. The proper conception and fulfillment of these principles will result in rapidity, safety, and economy of transportation.

HOW TO BUILD SMALL IRRIGATION DITCHES.

Introduction.

Serious Obstacles to be Overcome.—When a farmer enters a new country where irrigation is necessary he must determine (1) how he may best deliver water to his land, and (2) what crops are adapted to the soil and for local uses.

Everything with him is tentative. Unless he is fortified by an income outside of that obtained from his farm, the first few years he has a struggle for existence. That the pioneer is often overcome in this unequal fight is evidenced by many deserted homes and unfinished irrigation works. Owing to his inexperience in irrigation, he may lose his crops by not using the proper volume of water or by using it at the wrong time. One failure often means the abandonment of everything and a retreat to a region where conditions seem more favorable. In a new country where the rainfall is ample for the growth of crops serious obstacles must be overcome before returns are received for the labor expended. If, in addition to these difficulties, water must be brought to the land for irrigation and domestic purposes, the problems become much more complicated, and correspondingly greater credit is due when success rewards the attempt.

To the eastern farmer, whose cultivated lands are rolling and broken, the problem of spreading water over the surface of the ground from ditches has some serious phases. Often the stream passing his farm is bordered by steep bluffs, and its fall seldom exceeds 3 or 4 feet per mile. In his judgment the cost of raising water from such a source in sufficient quantities for irrigation would not be justified by the slight increase in yields or the saving of an occasional crop.

The western irrigator would arrive at the same conclusion if he had to deal with similar conditions. His agricultural land is nearly always smooth, and usually has a gentle slope with and toward some natural drainage channel, and would bear no crops without irrigation. The stream from which he proposes to draw his supply of water has a large fall, so that a ditch taken from it with a moderate grade can recede rapidly, and hence cover a large area in a short distance. A combination of these features makes it possible for individuals to construct irrigation works on the smaller streams. This chapter will deal with the kind of ditch a settler with limited means should build in a region with abundant water supply.

Small Ditches with Varying Grades and Cross Sectional Areas. The pioneer irrigator knew but little regarding the measurement of water, the carrying capacity of ditches, or the volume demanded by various crops. The experience of the first few years often convinced him that his ditch was too small, and he was compelled to enlarge it to provide an ample supply of water. The volume one man could handle he called an irrigating head. This was his first unit of measurement, and his ditch carried one, two, or three irrigating heads, according to his estimate. Crude measurements were afterward adopted to aid his judgment. He found it comparatively easy to measure the cross sectional area of a stream. His first gaugings were made in this manner, usually disregarding the velocity of the current. Experience in building ditches taught him in a few years how to adjust the size and grade of his ditch so as to furnish an adequate supply of water for the area to be irrigated. Some of the following considerations have been suggested by his experience:

Proper Grade of Ditch.—Many things affect the ease with which ditches can be built and water distributed from them. The length of ditch necessary to cover any piece of land depends on its fall compared with that of the stream and upon the elevation of the land to be irrigated. The smaller the grade of the ditch and the greater the fall of the stream, other things being equal, the shorter the ditch. However, the grade of the ditch should not be too light; otherwise its section must be greatly increased

to deliver the desired volume of water. The grade must not be excessive or the increased velocity of the current will result in the erosion of the ditch banks. Therefore, the range of grade which the ditch may have is limited, and its length largely depends on the fall of the stream.

On the quality of the soils through which the ditch must be constructed depend the permanency of its channel, the rate of velocity at which water can safely be carried, the cost of first construction, and the economic value of the ditch as a water carrier. As cheapness is a requisite for the construction of the class of ditches to be dealt with in this chapter, rock work or expensive flumes and other structures will not be considered.

Difficulties to be Met and Overcome.—In order to more clearly show the difficulties to be met and overcome, a practical case will be considered. Assume that it is desired to irrigate an area of 40 acres lying near a creek furnishing a sufficient supply of water; assume, also, that the creek has a fall of 20 feet per mile, and that the highest point of the land to be irrigated is 15 feet above the bottom of the creek at the nearest point. It will be seen that a point on the creek $\frac{3}{4}$ mile above is on the same level with the highest point of the 40 acres. It is evident that the head gate of the ditch must be above this point if we expect the water of the creek to flow to the farm, unless a dam be built in the creek to raise the water higher than its usual level.

Comparison of Possible Lines Upon Which a Ditch Might be Built.—It may be interesting as well as profitable to compare a few of the possible lines upon which the ditch might be built. That water tends to seek its own level is a principle that needs no demonstration, and it might be supposed that the least grade would cause the water to flow through the ditch. While it is true, it does not entirely answer the purpose, for the ditch must not only be one in which water will flow, but it must allow the water to run fast enough to deliver at the place where used a definite volume in a given time.

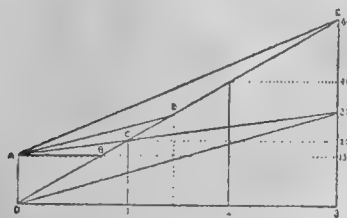


Figure 1.
Diagram Showing Lengths of
Ditches with Different
Grades.

The accompanying diagram (Figure 1) shows the relation between the grades of the ditches and the fall of the stream. The line 0 to 3 represents a level line through the bottom of the creek at the farm and running upstream from the farm. A to 15 is a level line through the highest point of the farm. The line 0 to E is the grade of the stream, 20 feet per mile. The numbers 0, 1, 2 and 3, at the bottom of the diagram, indicate miles upstream from the farm, and the numbers 15, 20, 30, 40 and 60, at the right, show the elevation in feet above the bottom of the creek at the farm. A to B, A to C, A to D and A to E are the lines of ditches built on the corresponding grades. As above stated, the grade of the stream is 20 feet per mile. If the grade of the ditch is 15 feet per mile, the two lines would approach each other at the rate of 5 feet per mile, and would come together at the point E to 3 to the base of the diagram, it is seen that the length of the ditch is 3 miles. If the minimum grade is taken at $\frac{1}{2}$ foot per mile, the length is about $\frac{1}{2}$ mile. The corresponding length of the ditches having grades of 5 and 10 feet per mile are 1 and $1\frac{3}{4}$ miles, respectively.

To illustrate how the length of the ditch depends upon the fall of the stream, let the line 0 to 30 represent the grade line of a stream having a fall of 10 feet per mile. A to C reduced to 30 shows that a ditch having a fall of 5 feet per mile is 3 miles long.

Two and one-half cubic feet of water per second is delivered by a ditch 3 feet wide on the top, 2 feet wide on the bottom, and 1 foot deep, with a grade of 4 feet per mile. Practically the same volume of water is carried by a ditch $4\frac{1}{2}$ feet wide on top, 3 feet wide on the bottom, and $1\frac{1}{2}$ feet deep, with a grade of 6 inches per mile. It may be instructive as well as interesting to compare these two ditches to determine which is the more economical to construct and to use.

If built to convey water to the farm located as before described, the larger ditch would be about $\frac{3}{4}$ mile long and would require the removal of 825 cubic yards of earth. The smaller ditch would be about 1 mile long, and 489 cubic yards of earth would be removed in its construction, a saving in the volume of earth of 41 per cent. The losses from seepage and evaporation in the two ditches would be in proportion to the surface exposed to the soil and to the air, and on this basis the loss in the larger ditch would be 12.5 per cent greater than that in the smaller. This comparison shows that the cost of construction of the smaller ditch is less, and that it is a more economical water carrier than the larger one.

A Large Head of Water More Economical Than a Small One.—In watering most crops the experienced irrigator knows that it is more economical to use a large head of water than a small one. A person can irrigate a given area in less than one-half the time with 2 cubic feet per second, and it might be utterly impossible to irrigate the land with $\frac{1}{2}$ cubic foot per second, for the reason that the stream would likely be absorbed by the ground and sink into the subsoil instead of flowing over the surface.

In the irrigation of most crops a man can handle 2 or $2\frac{1}{2}$ cubic feet of water per second with little difficulty. Assuming that $2\frac{1}{2}$ cubic feet of water per second is the largest volume that will be required at any one time, the problem is to construct a ditch that will deliver this volume to the land. The size of the ditch and the grade upon which it is to be built are questions which should be decided approximately before the trial line is run.

Methods of Running Grade Lines for Small Ditches. The grades for many of the early ditches were established by plowing a furrow or digging a trench from the creek to the land to be irrigated and permitting the water to flow as the channel was opened. If the water flowed too rapidly the furrow was turned toward higher ground, and in case the water failed to follow the trench lower ground was sought. After running the preliminary furrow the final adjustment in the grade was made by plowing a second one, which eliminated the depressions and deviations in the first.

Accuracy in Running Grade Lines.—The degree of accuracy which may be attained in grade lines run in this manner varies with the care taken in running the first and second furrows and in estimating the velocity of water flowing in them. If the banks of the ditch are high enough to prevent the water from overflowing them, time will usually even up the little inequalities in grade. Especially will this be true of those ditches that carry an appreciable quantity of silt, which is deposited wherever the current is slow. In this way depressions are filled up and the ditch is made even and uniform. This leveling up process is not confined to the ditch laid out in any particular way but is constantly going on in all waterways where inequalities of grade exist. One advantage conferred by this method is that no mistakes are made in the location; that is, there are no stretches in the ditch where no grade is allowed, nor does the grade run in the wrong direction. Wherever water flows in a small trench or furrow it will flow more readily in the completed ditch.

Triangle with Plumb Bob. One of the most common forms of leveling devices is the triangle or "A." It has probably been used to run the grades for a greater number of ditches than any other except the engineer's level. The ease with which it can be constructed and the simplicity of its adjustment and use are the points that have appealed strongly to the pioneer ditch builder. The usual form is that of a triangle whose base or longest side is from 10 to $16\frac{1}{2}$ feet in length. The different lengths which may conveniently be used are given in the following table:

Number of Triangles of Different Lengths Used in One Mile and the Amounts Which Should be Allowed for Various Grades.

Length of Base of Triangle	Number of Times Triangle must be Applied in a Mile	Amount to be Allowed in the Length of the Triangle for Different Grades						
		4 Feet per Mile	5 Feet per Mile	6 Feet per Mile	7 Feet per Mile	8 Feet per Mile	9 Feet per Mile	10 Feet per Mile
Feet		Inch	Inch	Inch	Inch	Inch	Inch	Inch
10	528	1-16	$\frac{1}{8}$	$\frac{1}{8}$	3-16	3-16	3-16	$\frac{1}{4}$
11	480	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	3-16	3-16	$\frac{1}{4}$	$\frac{1}{4}$
12	440	$\frac{1}{8}$	$\frac{1}{8}$	3-16	3-16	3-16	$\frac{1}{4}$	$\frac{1}{4}$
15	352	$\frac{1}{8}$	3-16	3-16	$\frac{1}{4}$	$\frac{1}{4}$	5-16	5-16
16	330	$\frac{1}{8}$	3-16	3-16	$\frac{1}{4}$	5-16	5-16	$\frac{3}{8}$
$16\frac{1}{2}$	320	$\frac{1}{8}$	3-16	$\frac{1}{4}$	$\frac{1}{4}$	5-16	5-16	$\frac{3}{8}$

The headings, 4 feet, etc., over the last seven columns of the preceding table are the number of feet of fall in the ditches per mile of length; the fractions in these columns give in inches the fall which must be allowed in the length of the triangle.

These are correct to the nearest 1-16 inch, which is as close as the instrument can be read. The table shows that if the triangle be 12 feet long and a fall of 3-16 inch be allowed, the grade of the ditch will vary between 5.5 and 5.8 per mile.

Figure 2 shows a triangle with a base of 11 feet. Its construction requires a 6-inch board, AC, 11 feet long, for the base; for the other long side, BC, a 4-inch board 11 feet long, and for the short side, AB, a 4-inch board 6½ feet long. The 4-inch board, BD, along which the plumb line hangs, is 5 feet and 3 inches long. Two or three wide staples should be driven into this board over the plumb line to limit its swing. The plumb line is of such length that the point of the plumb bob just clears the upper edge of the base, AC. The plumb bob for this device should have a long, slender point, so that its position can be more easily seen. A mark may be made on BD just above the plumb bob to indicate the center of its swing. The line is then read instead of the point of the plumb bob.

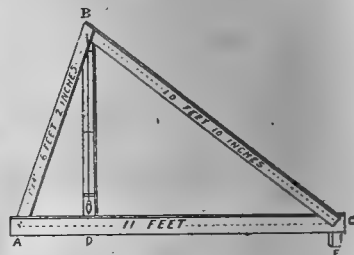


Figure 2.
Triangle with Plumb Bob.

Manner of Adjusting Triangle.—The adjustment of the triangle consists in locating and marking the place where the point of the bob or line comes when the base is level. This is done in the following manner: Drive two stakes in the ground making the distance between them equal to the length of the base of the triangle. The stakes should be driven so their tops will be as nearly level as can be estimated. Place the triangle with the ends of its base resting on the stakes; hold the triangle in a vertical plane and notice if the plumb swings clear of the staples; if it does not, drive the higher stake until it does. The plumb bob is allowed to settle, and a mark is made on the base directly under its point or back of the line on BD. The triangle is then reversed upon the stakes and another mark is made on the base or on the upright, BD. A permanent line is then drawn across the top of the base midway between the two marks already made or between those on BD. When the triangle is held in such a position that the point of the plumb bob or the line comes to the last marks made, the base of the triangle is level. A leg shown, E, 6 inches long, may be fastened to the forward end of the triangle.

To use the instrument for the location of a ditch line, begin at the lower end of the ditch and proceed as follows: Drive a stake at the starting point, leaving its top 6 inches above the surface of the ground. Place the end, A, of the triangle on this stake and put E on the ground, along the line of the proposed ditch, and move the higher or lower ground as necessary in order to bring the point of the plumb bob or the line to the mark that serves to indicate when the base is level. Two points on the same level are thus fixed. It is desired instead to find a point near E higher than the surface of the ground, at A, by an amount equal to the grade of the ditch in that distance. Shortening the leg, E, by this amount and moving it to higher ground, keeping the base, AC, level, the desired point is found. This point is marked by driving a stake in the ground, the top of which is 6 inches above the surface. The proper amount to be cut from the leg, E, may be determined in this manner: Divide 5,280, the number of feet in a mile, by 11, the length of the base, AC, of the triangle. The quotient, 480, is the number of times the triangle must be applied to the ground in laying out a mile of ditch. Divide the number of inches in the fall of the ditch per mile by 480 and the result will be the amount in fractional parts of an inch by which the leg, E, must be shortened. In a ditch having a fall of 5 feet, or 60 inches, per mile, this is 60 divided by 480, or 1/8 inch.

Method of Running Grade Lines. The following method of running grade lines with this device is probably more commonly employed: The leg, E, is dispensed with, and after the point locating the center of the swing of the plumb bob has been located, a piece of wood of such thickness as to allow for the grade in the length of the base is tacked under one of the ends, as at C. The work of laying out the line can begin either at the head gate or at the farm. If a suitable location for the head gate is found, it may be desirable to commence there. In this case, a stake, having its top 10 or 12 inches above the surface of the ground, is driven at the point selected for the head gate and the end, A, of the triangle is placed upon it. The end, C, is turned in the direction the ditch is to be run, and when the plumb bob

comes to rest at the mark indicating that the base is level, a stake is driven so that its top is even with the lower face of the piece of wood fastened under C. The tops of the stakes will then have the proper grade, and the triangle can be moved forward with the end, A, on the stake just located and another stake driven as before. This operation is repeated until the entire line is run. The line so located need not follow the contour of the country, but can be made fairly direct. Knowing that the tops of the stakes are on grade, the cut at any place can easily be found. If the top of the first stake is 15 inches above the grade line at the bottom of the ditch, to locate the bottom at any other station it is only necessary to measure down 15 inches from the top of the stake there.

The plumb bob is placed near the rear of the frame, because its position can be more easily seen by a person holding that end upon a stake, and the motion communicated to it by the movement of the end, C, is less.

How to Make the Frame.—The triangle is frequently used in connection with the carpenter's level, as shown in Figure 3. This device can be used in windy weather, when it would be almost impossible to run a line with a plumb bob. The frame may be made of two 3-inch boards, AB and AC, about 8 feet long, and a 2x4-inch piece, DE, about 6 feet long. The two pieces, AB and AC, are crossed at A and fastened with one nail; make the length of AB exactly equal to AC, say 8 feet, and make marks at B and C on the center line of the pieces. BC is a straight edge about 12 feet long, used temporarily in the construction of the frame. Mark upon its upper edge two points 11 feet apart. Bring the marks at B and C to the points on the straight edge, which is temporarily fastened with nails in this position. AD is now laid off equal to AE, say about 4 feet, and the two points, D and E, marked. The 2x4 piece, DE, is now laid across the frame, placing the upper edge on the points, D and E. It is to be fitted and permanently fastened in this position. The 3-inch boards, BE and DC, are next put in place and nailed there. They hold the ends of the legs securely in position. The amount of fall of 11 feet is then calculated. It is laid off and marked on AB, measuring from the upper end of BC. The piece of BC is now loosened at B and the upper edge brought to this mark. The legs of the triangle are cut along the straight edge of BC. The leg of AB should be marked in some way to indicate that it is to be used on the upstream end of the triangle.

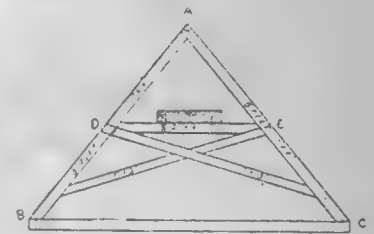


Figure 3.
Triangle with Carpenter's Level.

To Adjust the Leveling Device.—This method of constructing the leveling device assumes that the carpenter's level is in adjustment. If it needs adjusting, remove the level from the frame and proceed as follows: Drive two stakes, A and B, in the ground until their tops are nearly on the same level. Place one end, A, of the carpenter's level on the stake, A, and the other end, B, on the stake B. Drive one of the stakes until the bubble comes to the center of the tube. Place the end, A, of the level on the stake, B, and the end, B, on the stake, A, and note the position of the bubble. Reverse the ends of the level to their former position and see if the bubble returns to the center of the tube; if not, repeat the operation. If this cannot be brought about, the level should not be considered trustworthy and should not be used. After finding that the bubble returns to the center satisfactorily, place the end, A, upon the stake, B, and the end, B, on the stake, A, and correct one-half of the apparent error by the set-screw which fastens the spirit level to the wood of the carpenter's level. Reverse the ends of the level and drive one of the stakes until the bubble comes again to the center. Repeat this operation until the bubble is in the center in both positions. The level is then in adjustment, and the tops of the stakes are at the same elevation.

Replace the carpenter's level on the frame and the device is ready for use. It should be tested each time before being used. This can be done as follows: The carpenter's level is in adjustment and the upper edge of BC (Figure 3) is a straight line. Place the level on this line and drive two stakes, one at B and the other at C, so that their tops are even with the upper edge of BC, when the bubble is in the center of the tube. The tops of the stakes should then be nearly level. By reversing the straight edge several times they can be more accurately driven, and any error of the carpenter's level can be eliminated. When the tops of the stakes are on the same level replace the carpenter's level on the frame and make its legs the same length by adding a piece of wood to the shorter one, BC. When

the legs are set on the stakes the bubble should come to the center of the tube and should not change when the ends of the frame are reversed.

In use, whenever the bubble is in the center of the tube the leg, B, will stand on the ground as much higher than the leg, C, as will give the proper grade to the ditch. The leg, C, is placed on a hub, a small stake driven flush with the surface of the ground at the lower end of the ditch line. A point 11 feet above on the ditch line is then found where B touches the surface of the ground when the bubble is in the center of the tube. This point is also marked by a hub. These two points mark the grade line of the ditch. The frame is then carried forward, placing the leg, C, upon the last hub, and this operation is repeated until the ditch line is entirely located. In order that the hubs may be more easily found, a small stake is driven beside each.

Selection of a Site for the Head Gate and the Choice of Ditch Lines.

Figure 4 shows the farm, the creek, and the ground over which the ditch is to be built. The grade assumed for the ditch, AB, is 5 feet per mile, or one-fourth the fall of the creek.

Therefore, the creek rises in going upstream, four times as much as the ditch in going the same distance; hence, the line of the ditch will gradually approach the creek. The line and the creek will intersect at a point about 1 mile above the farm or about $\frac{1}{8}$ mile above B.

Best Location for Head Gate.—It frequently occurs, as shown in Figure 4, that the point where the preliminary line intersects the creek is not a suitable one for the location of the head gate. The banks of the creek are high, thus making a deep cut necessary, and owing to a bend in its channel the current is thrown toward the opposite side of the stream. If for any such reasons the ditch cannot be cheaply or conveniently taken out, the banks of the creek above should be carefully examined to see if there is not a more desirable location. Suppose a point, D, is found a quarter of a mile above, where the banks are not high and where an outer curve directs the current toward the head gate. If the stream is subject to sudden and heavy floods, it might be better for the head gate to be located on a straight portion of the channel rather than upon the curve.

Selection of Ditch Line.—After deciding that the head gate should be located at D, it is necessary to determine how to carry the water from there to the farm. The head gate, D, can either be connected with some point of the preliminary line, as B, or a new line can be run leading directly to the farm, as shown by the upper dotted line, DA.

There are a number of questions to be taken into consideration before a choice between the two lines should be decided upon. Usually the higher the ditch line the rougher the country. Often rock is encountered, and the upper line is generally much more crooked if it follows the surface of the ground. A line run directly from the head gate to the farm has a grade of about 7 feet per mile. However, if this country is more broken than that along the preliminary line, the upper ditch will be crooked, and hence be longer than it has been estimated. This increased length will reduce the grade. Suppose in this case that, after examining the country

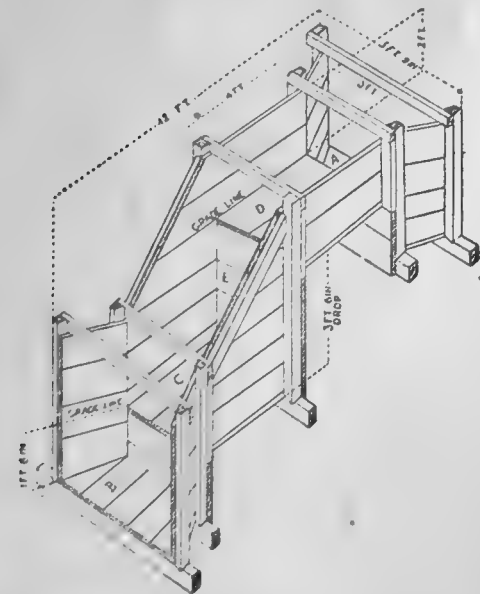


Figure 5.
Details of Timber Drop in Ditch.

along the upper line, it is found that a large quantity of rocks would be encountered in the construction of the ditch. It is necessary then to go back to the head gate and examine the country between that point and the preliminary line. It is found that a short ditch, DCB, running from the head gate to connect with the preliminary line can be built. A uniform grade can be maintained by constructing a

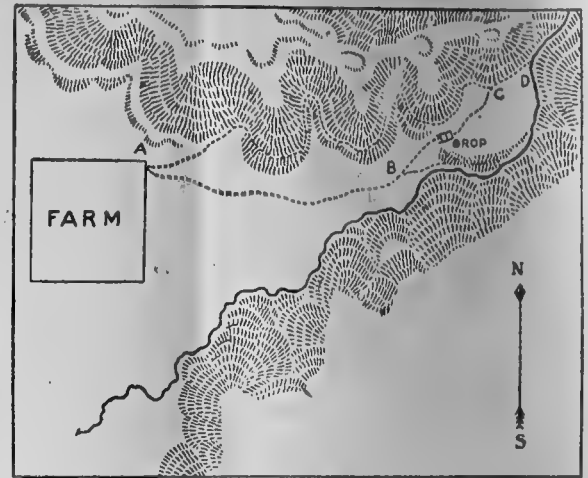


Figure 4.
Sketch Showing Location of Farm and Possible Ditch Lines.

drop, located as shown in Figure 4. This compromise between the two lines is therefore decided upon. The fall of water over the drop is $3\frac{1}{2}$ feet, thus allowing a grade of 6 feet per mile in the short distance. If this precaution were not taken its channel would be worn away in a short time, and the materials thus washed out would be deposited in the lower ditch, from which place it would have to be removed. The drop (Figure 5) consists of a short flume, D, with a flaring approach and submerged platform, A. The floor, C, on the grade of the ditch below the drop, breaks the force of the falling water. The flaring wings and submerged platform at B protect the ditch at that point. The dimensions are also shown in Figure 5.

Methods of Marking Ditch Line.—To mark the line of the ditch with a furrow after it has been properly located, let one man guide the team, walking between the heads of the horses and holding a bit in each hand, while another holds the plow. If the surface of the ground will permit a wagon to be driven over the line, the plow may be attached to the rear axle, the driver directing the team from the seat of the wagon. The team is driven in such a direction as to turn the furrow to the lower side of the ditch. If the surface of the ground is comparatively level across the line of the ditch it is not necessary to follow the stakes closely in the bends. The ditch will be better for being straightened a little, which may be done by going above the stakes to locate the bends nearest the creek and a little below the stakes that locate the bends farthest away. If the ground slopes very

much across the ditch line the stakes must be followed closely. After the line is marked, two or three furrows are plowed turning them to the lower side. A ditch of this size may be built wholly with an ordinary plow, by going over the line a number of times. The loose earth in the bottom of the ditch may be removed with a plank scraper, shown in Figure 6. The tongue should be long enough to allow the team to work below the bank. The scraper is lifted over the loose earth as the team backs, and the load is dragged out as the team moves forward. A ditch of the size contemplated is rather too small to admit of using the ordinary scraper to advantage.

A small ditch of the kind described might be used for years without a head gate. It will, however, be much better to have one, so the water can be shut off when it is not needed for irrigation.

Head Gate.

Figure 7 shows a common type of small head gate. It consists of a box or flume 6 feet long, 3 feet wide and 3 feet deep, with a gate, D, at the end nearest the creek. At both ends the sides flare at an angle of 30 degrees. Under them, $1\frac{1}{2}$ feet below the floor of the structure, C, platforms A and B are built. Both of these platforms are covered with earth to the level of the floor, C. Earth also is carefully tamped around the outside of the gate.

All precautions should be taken to prevent water from working along the outside of the head gate. The structure may be undermined in a short time if only a small stream finds its way between the planks and the earth. The flaring wings and submerged platform are built to prevent this action, and also to make the structure secure in case of high water.

Laying Out Field Laterals. of the laterals furnishes an opportunity for the irrigator to show his skill. While the land is new, spreading water over it will be a difficult matter. It may be impossible to properly locate the main laterals at first, and supplemental laterals and dikes may have to be constructed. Before the crops can be harvested these temporary channels must be filled in and the ground leveled. Theoretically they should be given such a grade as will result in a moderate velocity for the water, but not sufficient to wash the earth along the sides and the bottom of the ditch. One irrigator of considerable experience

much across the ditch line the stakes must be followed closely. After the line is marked, two or three furrows are plowed turning them to the lower side. A ditch of this size may be built wholly with an ordinary plow, by going over the line a number of times. The loose earth in the bottom of the ditch may be removed with a plank scraper, shown in Figure 6. The tongue should be long enough to allow the team to work below the bank. The scraper is lifted over the loose earth as the team backs, and the load is dragged out as the team moves forward. A ditch of the size contemplated is rather too small to admit of using the ordinary scraper to advantage.

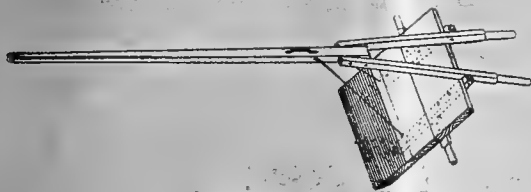


Figure 6. Plank Scraper.

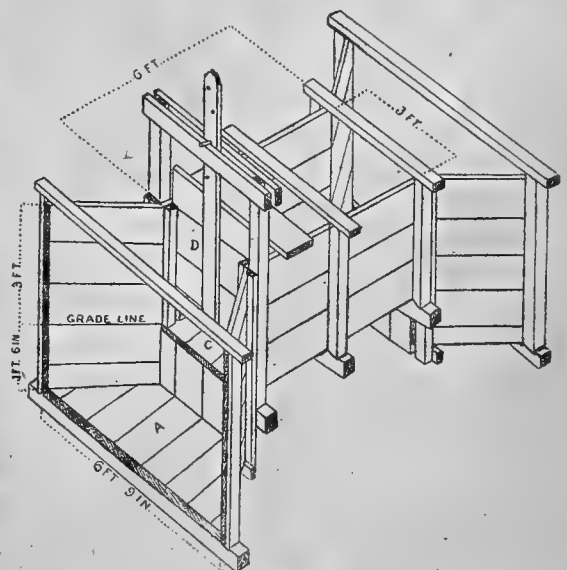


Figure 7. Details of Head Gate.

recommends that the field laterals should have a fall of at least 10 feet per mile. The laterals should be located nearly at right angles with the direction of the greatest slope of the land so that water will flow from rather than along them. Mistakes can be made in constructing them parallel with the steepest slope. When the water is turned from these it tends to follow rather than to flow away from them, thus adding greatly to the work of irrigation. If the surface of the ground is somewhat uneven the problem of locating the permanent laterals becomes correspondingly more difficult, often rendering the use of the engineer's level necessary. It may be possible to cover all the ground by locating the laterals along the ridges, or there may be high points entirely surrounded by lower grounds making it necessary to build bridges on artificial ridges, or dikes, to carry the water to them.

The inexperienced irrigator often considers that the ground occupied by the laterals is wasted land, because it bears no crop. Accordingly he makes them far apart, so that the water must flow a long distance to cover the surface between any two. This usually results in the overirrigation of that portion of the crop near the lateral in use, as the water must be kept flowing there until the entire surface to the next lateral is irrigated.

Preparation of Surface.—It will usually pay to do some work in smoothing off the little irregularities in the surface of the farm. This may be done with a plank scraper, or drag, after the ground has been plowed. The drag cuts away the higher points and leaves the dirt in the hollows. This preparation of the surface is quite important, as it reduces the time and labor required in irrigating. A more uniform distribution of water is often obtained, which increases its efficiency. Theoretically, the surface of the ground should be a plain surface, with just slope enough to allow the water, when delivered at the highest point, to flow in a thin, uniform sheet.

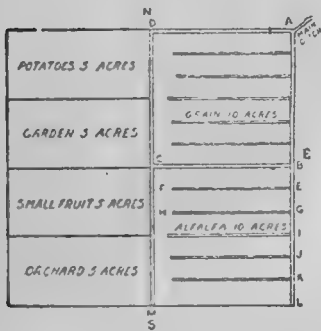


Figure 8.
Plat of Farm Showing Laterals.

We will assume that the farm is planted to such crops as are ordinarily found in the arid region, say 10 acres of alfalfa, 10 acres of grain, 5 acres of potatoes, 5 acres of garden, 5 acres of small fruits, and 5 acres of orchard, as shown on the plat of the farm (Figure 8).

If it be assumed that there is a fall of 4 feet across the farm from north to south and 2 feet from east to west, the water can be made to flow either west or south from any point. The greatest slope of the land is a little south of southwest, and this is the direction the water takes if left to itself. If laterals are run south from the main ditch they will make an angle of about 70 degrees with this line. Such an arrangement permits the water to flow away from rather than along the laterals. The main ditch divides at A, as shown in Figure 8; one branch runs south to L, while a second runs west to D, the middle of the north line of the farm, where it turns and flows south to M. The field laterals receive their supply of water directly from these ditches.

Method of Applying Water to Crops.—Alfalfa is irrigated by the method known as flooding, which may be described as follows: Nearly parallel ditches, BC, EF, etc., are made 100 to 150 feet apart through the field. In the present case ditches are made 110 feet apart, dividing the field into six strips. As these laterals will remain as long as the field is in alfalfa, we may put division boxes (see Figure 9) at B, E, G, etc., where the laterals are taken from the main ditch. This will avoid cutting through the ditch bank and refilling with earth when the water is changed from one lateral to another. The division box is simply a short flume, placed in the ditch with a channel leading away, usually at right angles. Vertical cleats are provided for holding flash boards in place or checking the water. These boards may be placed either in the branch or the main ditch, as desired.

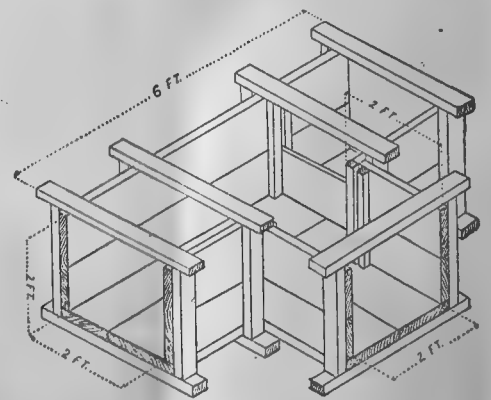


Figure 9.
Details of Division Box.

The division box at A (Figure 8) is set so that water will flow to B. At this point the division box is so adjusted that water runs into the lateral, BC, and the lower bank of the lateral is cut a few feet from B. Just below the cut a canvas dam is thrown across the ditch to force the water over the surface of the ground. The canvas dam is a piece of heavy cloth, 5 or 6 feet long and 3 or 4 feet wide, one edge of which is tacked to a pole long enough to rest on the banks as it is thrown across the ditch. The cloth rests against the bottom and sides of the ditch above the pole, where two or three shovelfuls of dirt are placed to hold it in position. When the water from lateral BC flowing over the surface reaches the lateral EF, entirely covering the intermediate area, another cut is made in BC, 100 to 150 feet farther from B. The canvas dam is again used to check the water, which is allowed to flow out as before. This alteration is repeated till the entire surface of the first strip has been covered. The division box at B is then set to shut the water from the lateral BC and allow it to flow to E, where it runs into the lateral EF, and from it over the surface of the next strip. In this manner strip after strip is irrigated till the entire field is covered. The field laterals are not so large as the main ditch, and it may be necessary to divide the water between two or more of them.

Assuming that it will require a quantity of water sufficient to cover the field to a depth of six inches, in order to give it a thorough irrigation, it will take about 24 hours to irrigate the entire field. The ditch must carry $2\frac{1}{2}$ cubic feet of water per second to accomplish this.

The grain crop is irrigated in the same manner. The laterals in the grain field may be about the same distance apart as those in the alfalfa field. They may be built with an ordinary plow by turning two furrows away from each other, or may be made with a special plow having two moldboards. This tube throws the dirt out of the ditch on both sides and completes the lateral in one operation. These laterals are used only for the one crop, and are filled with the plow just before the harvest, so that the binder may cross them in cutting the grain. If the grain is sown with a drill running east and west the small furrows made by it form miniature ditches, which the water follows. The irrigator must see that the water reaches those places where, on account of elevations or obstructions, it does not run readily.

Furrow Irrigation.—For the irrigation of the crops on the south half of the farm, furrow irrigation is employed. The potatoes are planted in rows and are furrowed out before being irrigated. This is done by running a shovel plow between the rows, making small ditches, into which the water is turned and allowed to flow until it has reached the other end of the field. The water is set on a certain number of rows, allowing only a small stream to flow in each. The surface is not flooded but the water is confined to the furrows and percolates laterally into the soil. The water is taken out of the permanent lateral, DM, at the corner of the field and carried along in a temporary ditch parallel to it. After a strip 100 to 150 feet wide, containing forty or fifty rows, has been irrigated from the first opening, the main lateral is cut further down, and the process is repeated. The garden may be irrigated in a manner similar to that described for the potatoes.

The small fruits and the orchard are crops of a more permanent character, and will occupy the same ground for a number of years. For these reasons division boxes are placed in the main lateral where it is desired to take out water. Ordinarily small fruits are irrigated by the furrow method. It is thought better practice by some irrigators to allow a small stream of water to flow between the rows for a considerable time than to allow a large stream to run for a short period. This gives more opportunity for the water to soak into the soil, leaving it in the same condition as does a heavy rain.

The orchard is irrigated either by flooding or by furrows. Of the two, the furrow system is perhaps more often used. Parallel furrows, 3 to 6 feet apart, are made and small streams of water are allowed to flow in them until the ground is thoroughly saturated.

In some localities the best results are obtained from the orchards when the entire surface of the ground is flooded. Care is taken, however, to keep the water away from the trees, as it is found that they thrive better when the water does not touch them, but percolates into the soil and reaches the roots. When all the ground between the trees is moistened the roots spread uniformly. When furrows are used for irrigating orchards they are often plowed in after water has been applied. The ground is then leveled and the surface finely pulverized. So long as the surface of the ground remains in this condition evaporation is greatly reduced. This method requires considerable work, as the laterals have to be made some time prior to the irrigation of the orchard.

There are other methods of applying water to crops, but all of them require a more elaborate preparation of the surface of the ground, and need not be described here.

Cultivation Should Follow Irrigation.—When it is possible, cultivation should follow each irrigation as soon as the ground is dry enough to be worked. If all crops could be cultivated in this way the amount of water which would have to be applied would be greatly reduced. The duty of water is uniformly small for corn, potatoes, orchards, and other crops which can be easily cultivated. If the ground cannot be cultivated after it has been irrigated, the surface will often bake. This is injurious to some kinds of plant growth, and evaporation is thereby greatly increased, making another irrigation necessary much sooner than it would otherwise be.

When to Irrigate. In order to determine just when crops need water and when to apply it so that they will not suffer from drought, nor be injured by too frequent or too generous applications, requires a knowledge and experience that can be gained only by practice and a close observation of various crops under irrigation. It is the experience of many practical irrigators that if an unlimited supply of water is available, crops more frequently suffer from overirrigation than from drought. It is difficult to determine when the development of the crop is first arrested on account of a lack of moisture to the soil. Some experimenters maintain that this point can be more definitely decided by an examination of the soil than by the appearance of the plant, as the latter shows evidence of the check in its growth some days after it has occurred. Usually it is then too late to prevent serious loss, as the crop rarely recovers from such treatment, and seldom reaches the development it would have attained if it had been irrigated at the proper time.

Plants will usually indicate by a change in color or by their general appearance whether they need water or when they have been overirrigated. Most field crops turn a darker green when in need of water, and the leaves and stems show a tendency to droop and curl. The lower leaves assume a pale yellow. A crisp or a dead appearance in the lower leaves is one of the best indications that a plant needs water. Grain which has suffered from drought may mature, but the straw will be small and short and the kernels will be shrunken and inferior in quality. Alfalfa and similar crops have the appearance of cured hay. Where field crops are overirrigated, the color of the foliage becomes a yellowish green and the plants have a sickly appearance. These indications vary with the quality of the soil, so that it is impossible to lay down fixed rules to govern the number or frequency of irrigations. Only close observation for a number of years on the same farm will enable a person to tell by the appearance of plants whether they need water or not.

The amount of moisture in the soil may be determined with sufficient accuracy or the needs of the plant by examining a sample taken a few inches from the surface of the ground. If it clings together when molded in a ball and shows the print of the fingers, there is moisture enough present. If the earth falls apart when the hands are opened irrigation is needed. As stated above, this point is passed some days before the plant shows indications of suffering.

Cost of Building and Maintaining a Ditch.

The cost of a small system of irrigation, similar to that already described, may properly be considered here. The ditch is $1\frac{1}{4}$ miles long, and the main laterals on the farm are of the same cross sectional dimensions, and are $\frac{5}{8}$ mile long. The laterals in the alfalfa and grain fields have a total length of $1\frac{1}{4}$ miles and are slightly smaller. A short calculation shows that nearly 1,250 cubic yards will have to be moved in the construction of these ditches. This volume at 5 cents per cubic yard makes the cost of the work \$62.50. The head gate requires 360 feet B. M. of 2-inch planks and 2x4-inch scantling, at a cost of \$15.00 to \$18.00 per M. The thirty division boxes are made of 2-inch lumber and require nearly 4,000 feet B. M. The head gate, drop, and division boxes will cost, in place, not far from \$125.00. This will make an investment of about \$200.00 in the complete ditches.

Quantity of Water Required for Ordinary Field Crops.—It has been demonstrated by experiment that it requires a volume of water sufficient to cover the area to a depth of 2 or 3 feet to mature ordinary field crops. Basing the calculation on these figures, and assuming that there is no rainfall during the irrigation season, it will require an aggregate of from sixteen to twenty-four days to complete the work of irrigation if the ditch delivers $2\frac{1}{2}$ cubic feet of water per second and the work is carried on night and day. Assuming that twenty days is a mean period for this work, the cost of irrigation, therefore

approximates \$1.00 per acre. Since some crops require that the water be watched continually during the irrigation, the cost per acre is increased somewhat, owing to the necessity of employing a man to work at night. The average cost probably does not exceed \$1.20 per acre.

After the first year the cost of repairs will amount to something like 10 per cent of the original outlay in building the ditch, or about \$20.00.

The following summarizes the original cost of the ditch and the laterals and the yearly outlay for repairs and labor:

Cost of Ditch and Laterals.

Making level and running the line	\$ 12.00
Cost of excavation of ditches and laterals	62.50
Cost of head gate, drop, division boxes, etc	125.00
Total	\$199.50

Yearly Cost of Irrigation and Maintenance of Ditches.

Labor in irrigating	\$48.00
Repairs to ditches	20.00
Total	\$68.00

In above estimate the labor has been included at average prices for such work. If the farmer has time to do the work himself, his only cash outlay will be for lumber.

THE TRUTH ABOUT STOCK FOODS.

Facts that Every Farmer and Stockman Should Know.

We know of no good reason why the American farmer or stockman, who is constantly besieged to invest his good money in this and that brand of stock food, should not know the full truth about that article.

He not only should know, but he is entitled to know, not only for the satisfaction of knowing what he is getting for his money, but in self defense, that he may know what kind of stuff he is feeding his animals, the latter perhaps the most important reason of all. You would never think of buying a brood mare, a Jersey bull, a Berkshire sow, or a pen of thoroughbred Wyandottes, without knowing the pedigree of that stock. You want to know its history, its performance in the past. In other words, what it is made of and what it will do; so, why should anyone expect you to buy a "pig in a poke" in the shape of a stock food, something about which you know absolutely nothing, except glittering generalities claimed by the makers?

Perhaps you can afford to experiment with old Brindle, or with that bunch of mongrel hens, or old Bill, the plow horse, who has seen his best days. They can probably stand it, and at any rate you are not apt to lose so heavily if anything goes wrong. But when it comes to that fine litter of Berkshires, those Jersey butter makers, or that pen of young Leghorns, that you bought at a fancy price, well, you would like to know just where you are at before you begin to dope that kind of stock with a strange mixture. Wouldn't you?

But if a stock food has any merits at all, if it will help you to get more profit out of common stock, you should be able to feed it to even thoroughbred stock with implicit confidence and get larger proportionate returns.

But, first of all, why give stock food at all—just because the manufacturer said so? That's a mighty poor reason, isn't it? If your stock is doing well, perhaps it might be best to let well enough alone, rather than take chances. If there is serious trouble, perhaps a veterinarian is needed, rather than stock food.

So, before the stockman can intelligently feed stock food, he must know the philosophy of the thing, why he is doing it and what specific object he expects to gain.

The first important thing about stock food that the stockman should know is that he knows practically nothing about the stock foods on the market today, for the simple reason that nothing has been told him. He doesn't really know what the package contains, what it is made of, what the ingredients are supposed to be, or what they are for; neither does he know whether he is paying a reasonable or an exorbitant price for the goods or for the results he expects to gain. He is asked to feed the article blindly and assume that the makers know more about the feeding of his particular stock than he does himself. What the stockman wants is facts. He is not simply actuated by a desire to achieve some of the wonderful results painted in such glowing colors by the makers. He does not care to go into the freak business for the dime museums, but what he does want to do is to improve the general health and feeding qualities of his domestic animals. What is there then in these various preparations to give these returns?

And yet, when the stockman does invest in such goods, nine times out of ten it is because of the urgency of the appeal, rather than of his own free will. He makes the venture against his better judgment, in the hope that his fellow man is as honest as he is himself and will give him a square deal. He also hopes in a measure for the results that the literature indicates. Surely a worthy reason, but, under the circumstances, a mere speculation, and in these days of progress, when everything else about the farm, the live stock business, breeding, feeding, etc., has been reduced to such a definite, scientific basis, the stockman should not be asked nor expected to buy stock food upon speculation.

Another thing that the stockman should know is that when he does invest in stock foods that are now upon the market, however sure he may feel of his gain in results, he will certainly get the short end of the bargain as long as he continues to buy something about which he knows absolutely nothing, with only the manufacturer's word for it that it cannot do any harm and will prove useful. Again, legitimate stock foods have suffered more or less on account of the innumerable cheap and worthless preparations put out under the guise of stock foods by unscrupulous manufacturers.

The stockman well knows that any stock food must contain some percentage of some article as a filler to provide a vehicle for the convenient carrying of the proper drugs, facilitating the measuring and the administering of the medicinal agents contained therein.

We must not assume that on account of questionable, and in some cases unscrupulous, methods which have and do exist in the making of stock foods, that the whole idea of stock foods is a delusion and a snare, without any legitimate purpose than the mere waste of money. That would be an insult to the intelligence of thousands of the best breeders and feeders in this country, as well as in foreign countries, who have used stock foods, condition powders and condiments for ages. Stock raisers in this country, during the past decade, have demonstrated beyond all possibility of a doubt that stock foods may safely be accepted as a suitable and valuable adjunct to economic and profitable stock raising, breeding and feeding.

England and Scotland, pioneers in improved stock breeding, share the honor of first recommending the value of condiments. They have used them in some form or another for centuries. Breeders and feeders of those countries would as soon think of raising stock without good stock food as they would attempting to fatten without grain.

The Philosophy of Stock Food. Its Purpose and Possibilities.

There is only one logical and legitimate purpose of a stock food, and that is to assist nature in keeping stock in prime condition by toning and invigorating the system, by keeping the blood pure and the bowels regular, and by so aiding and assisting the digestive organs that they will be able to obtain all the nourishment from the food that you give them, thus more than paying for the stock foods used.

The actions of an ideal stock food are threefold: First, stomachic; second, digestive; third, tonic. The first, stomachic, means that it is a digestant, for it stimulates the flow of the saliva and the gastric juices of the stomach and intestines, and increases the muscular action of the bowels, thus assisting peristalsis, and guarding against constipation. In accomplishing these results the ideal stock food materially assists in the assimilation of the digestible nutrients by the lymphatic villi and the capillaries.

It is a tonic. It nourishes and tones the nervous system, both directly and indirectly. It purifies the blood, both by contact and by so invigorating the various organs of the body that they are able to properly perform their functions.

The foregoing are the general purposes of a stock food, and the accomplishment of these ends means much in dollars and cents and in additional service and profit to the stock raiser.

Stock food is not a patent medicine for animals. It is not, never was intended to be, and should not be called or advertised as a cure all, or a remedy in specific diseases. It should be and is a great preventive of disease, but accomplishes its end only by assisting nature, by helping to keep the system in a healthy, vigorous condition, so that it is able to withstand the attacks of germs and diseases that would find an animal in poor condition a ready victim. Take, for instance, worms, perhaps the most prevalent and insidious foe to the animal world. The consumption of worms in the shape of eggs and larvae cannot be avoided by the animal in feeding, for these pests are omnipresent. A good stock food should contain an anthelmintic, and in performing its regular functions, by assisting and increasing the secretion of the various digestive juices, assist nature in disposing of these incipient worms before they have a chance to develop and breed in the intestines. But once they get past the stomach and are allowed to develop in the intestines, they oftentimes work irreparable injury and require more heroic treatment than a stock food to get rid of them. Should they be allowed to develop thus far, we strongly advise a specific remedy, administered either by a veterinarian or yourself, in the shape of a good, reliable vermifuge or worm powder. Stock food cannot accomplish impossibilities. It cannot take the place of clean housing and bedding, pure water, kind treatment and plenty of good feed, intelligently fed, although in a measure it may atone for some shortcomings in the foregoing.

This is the philosophy of stock food. Any claims beyond these are likely to be misleading and overdrawn, and yet the possibilities of increased service and profit resulting from the faithful, judicious use of a good stock food, along the simple lines indicated, are truly wonderful and so pronounced in some cases as to seem greatly exaggerated.

A Common Prejudice Against Stock Foods. But some argue and very plausibly that they believe that right feeding and right treatment is the best medicine. Let nature do the rest. This argument might be sound if your animals were living under natural conditions, and if you were equipped to take care of them as they should be. But this is not the case. They are no longer nature's subjects in the animal kingdom. They are man's subjects. Under modern conditions they are machines.

For instance, the horse: The original wild horse in his natural state roamed the plains at will in warm, temperate climates, cropping the sweet grasses to his heart's content, nibbling an herb here and there as instinct prompted him (herbs, roots, and bark were nature's stock foods). He had at all times just enough feed of the right kind, regardless of market prices, to supply his daily needs; he had just enough pleasant exercise to keep his blood in active circulation, with plenty of rest whenever nature prompted it to soothe and refresh his nerves. The reproductive organs were regularly called into action at appointed times, both male and female lived as nature intended.

But now the horse is a machine, a great power plant, driven hard and ruthlessly day by day, to furnish power for man's uses, and only a favored few of either sex may exercise the functions of reproduction. In the male, nature is tampered with; in the female, nature is thwarted. They lack, therefore, the natural action and instinct of the original horse. The modern dairy cow is a milking machine, a butter and cheese maker, while in the natural state she was called upon only to produce enough milk to nourish her young up to a feeding point, and spend the balance of her time with the herd.

The original jungle fowl exercised both wing and feet, with plenty of grain and plenty of meat at hand whenever she wanted it. She laid eggs enough in season to reproduce her kind and quit. Today the hen is an egg machine, constantly driven to the limit, being speeded up to 200 eggs a year limit, as fast as man knows how to speed her. Her forage ground is a small tract and often a damp, filthy coop, a small gravel run, a manure heap, and, if she is fortunate, a little grass. She depends almost entirely for sustenance upon what man sees fit to give her, and even her natural functions of motherhood are denied her, the incubator and brooder taking her place.

Are these natural conditions? Hardly. They are machine shop conditions. Man is the superintendent of this factory, and must not only see to the furnishing of the fuel that furnishes the steam and power, but also that the machine is properly geared and that all the wheels and points of friction are

oiled. In other words, he must give nature that assistance which he himself has rendered necessary by his own interference with nature's plans.

We can safely assume, then, that the intelligent and judicious use of stock food for the purpose outlined is just as necessary and natural as the continued use of condiments to the human family. How many of us, for instance, could get along without our spices, our salt, our pepper, our spring tonics, and our laxatives to keep the bowels open, and similar aids to nature, adopted by modern humanity. All of these things, while seemingly unnecessary and contrary to nature, are yet rendered indispensable by the unnatural pace at which we live today.

Abusing nature, as we do, therefore, both in the human and in the animal world, let us not lay on to mother nature all the burden of the responsibility of keeping things going right. Let us render what help we can toward repairing the damage which our interference with nature's methods has caused. We must help nature in keeping this vast animal machine shop in constant and smooth running order. Stock food has its legitimate place in the world's work today.

We realize that we are blazing a way along a new path, that we are pioneers in the policy of taking the purchaser into our fullest confidence, giving him the same degree of our confidence that we ask of him. We are willing to rest our case with the sound judgment of the American stock raiser, and we confidently believe that when the sincerity of our methods and our policy is once fully realized by the American buyer of stock food that our returns in sales will fully justify our efforts to return confidence for confidence, to meet the buyers half way in solving the much vexed stock food problem.

Our Formulas Are Public.

They belong to the purchaser. We are simply his supply agents, if he sees fit to use us, and we believe he will after he has investigated to his entire satisfaction, and finds what we can do for him as compared with what he can do for himself. We want our stock foods to practically sell themselves, by appealing to the good judgment of the buyer, rather than to have them forced on him by long winded arguments. With this end in view, instead of offering you a mixture of mysterious and rare ingredients, you will find in Davis Stock Food only such simple and time tried ingredients as have been proved by long experience to be the best fitted for their respective purposes, well known drugs and condiments, which have the official endorsement of the leading authorities and practitioners of the United States.

The ingredients are published openly on every package of stock food sold. There is no buying a "pig in a poke" when you buy a package of Davis Stock Food—you know exactly what you are getting and what you are paying for it. Nothing is left in doubt; nothing left to your imagination.



Our Guarantee

No.

We hereby guarantee the contents of this package to be composed of the ingredients as printed on this package; that all the drugs are absolutely pure and conform to the standard of the United States Pharmacopea.

Furthermore, use the entire contents of this package as directed, and if you are not entirely satisfied, return this certificate telling us why you are not satisfied, and we will cheerfully refund every cent you have paid us.

The foregoing applies to all preparations manufactured by us.

CHICAGO, ILLINOIS, U. S. A.

Signed, *Davis Stock Food Co.*

Our Guarantee. Read the guarantee of the Davis Stock Food Company that is reproduced on the preceding page. It is a facsimile of the certificate appearing on every label, on every package of the products manufactured by the Davis Stock Food Company. It is a guarantee that guarantees. This is not merely an advertisement; it is part and parcel of the contract covering every purchase of Davis Stock Food Company products, no matter where, when or how you buy them.

The list of ingredients is not only published openly, but you are given a bona fide written guarantee, right on the package, to the effect that the contents are exactly what they are claimed to be, that and nothing else. You are at liberty to subject these goods to the examination and analysis of any chemist in the country, to your agricultural college or to the Department of Animal Industry, at any time; in fact, we invite you to do this; we have nothing to fear, nothing to lose and everything to gain by the test, for the results will only serve to strengthen our position in the esteem and confidence of the stock food buyer.

With every package of the Davis goods you buy, whether for horses, cattle, sheep, hogs, or poultry, you get the same frank statement of facts, the same open formulas, the same ironclad guarantee, as part and parcel of the contract; the same degree of protection. This does not refer to your first or your second order, but to each and every order, whether you buy this month, next month, next year, or five years from now.

Davis Stock Food Always Maintains the Same Uniform Quality.—This policy insures continued uniformity in the quality of our goods from month to month, from year to year.

Money Back if Not Satisfied. If at any time, in any place, under any circumstances, you find a package of Davis Stock Food the contents of which are not exactly as represented in every particular and detail, or if the results are not absolutely satisfactory when used according to directions, you can do us no greater favor than to communicate with the parties from whom it was purchased, they are authorized to refund your money. If they do not, write us immediately and we will.

How can we introduce Davis Stock Food to you on any more honest and equitable basis? Can you suggest a fairer plan? Can you discover any flaws or weak spots in our proposed plan of doing business? If you can, or if you feel that you can detect any note of insincerity in our proposition, we would consider it a favor if you will write us frankly and tell us about it, for the entire success of our business, along the new lines that we propose to run it, depends upon the soundness of our policy and the degree of confidence and favor with which it is received by the stock food buyer.

Upon this guarantee, upon the published formula and upon the quality of the material which these two features naturally insure you, are based the fundamental principles in conformity with which we expect to build the largest legitimate stock food business in the world.

A Legal Contract.

The guarantee certificate means exactly what it says. It is a legal contract which will be recognized by any court of law or equity in this broad land. It protects you fully in your purchase and use of Davis Stock Food. You take no possible chance.

TELL US: Is there any other stock food manufacturer who dares to pursue a policy like this? If there is, why doesn't he do it?

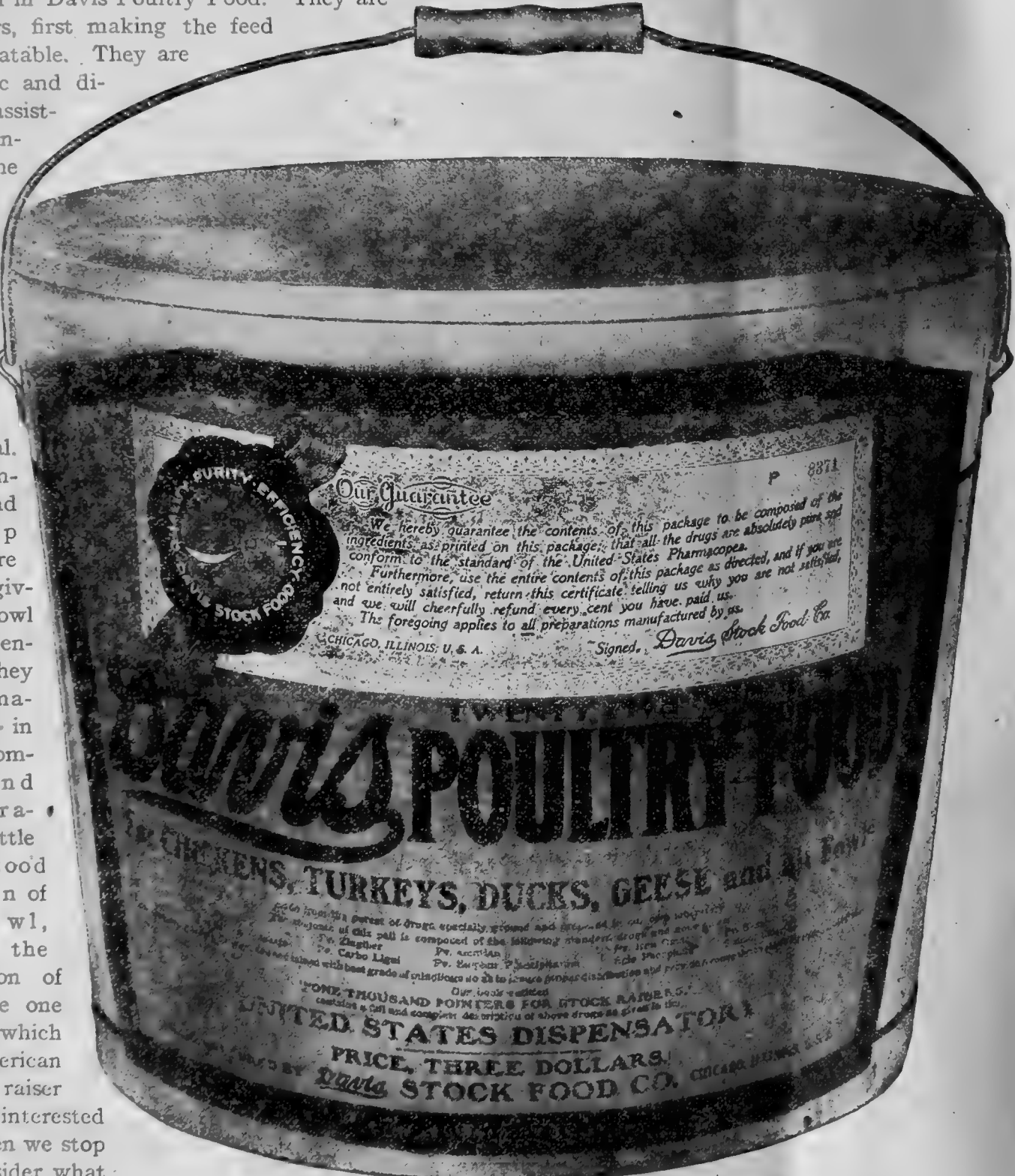
As our business grows, Davis will, no doubt, be imitated and copied by other makers as closely as the honesty of their methods, quality of their goods and legitimacy of their margins of profit will allow. We are blazing a new path of honesty and legitimate business methods in the stock food business, and before we are through we expect the American stock raiser to be with us, and the opinion of the American stock raiser will compel all other legitimate stock food companies to do likewise. Davis and his products will undoubtedly be bitterly assailed, but just remember this, **legitimate manufacturers who put out legitimate preparations will be only too glad to do as Davis is doing. It is they who see danger in publicity to their business that will make the bitterest fight, and when an attack on Davis' methods and Davis Stock Food is brought to your attention, just remember this, and ask yourself why.**

DAVIS POULTRY FOOD.

A New Departure in Poultry Food.

are found in Davis Poultry Food. They are appetizers, first making the feed more palatable. They are stomachic and digestive, assisting and insuring the proper digestion of the feed. They are anti-septic in the alimentary canal. They stimulate and tone up the entire system, giving the fowl life and energy. They assist materially in that complex and comparatively little understood function of the fowl, namely, the production of eggs, the one function which the American poultry raiser is vitally interested in. When we stop and consider what the American fowl is today, as compared with her sister of past generations, we must marvel at the change man has wrought. The

You Never Had Anything Like It.—Davis Poultry Food is condimental, digestive and corrective. The ingredients of which it is composed are printed in plain letters on every package. A great many of them have been used by other manufacturers separately, but never in the combination in which they



Send all orders to Sears, Roebuck & Co., Chicago, Ill.
Sears, Roebuck & Co. Catalogue No. 65F140, 25-lb. pail Davis Poultry Food, \$3.00.

fowl of nature was called upon to lay only sufficient eggs to reproduce her kind. After laying these eggs it became her duty to hatch them, which she did, and laid no more eggs for another season. All this has changed. The American hen of today is a machine for the production of eggs, highly developed and run to her maximum capacity. In this deviation from the natural order of things, man has materially interfered with nature; and, having done so, has introduced conditions that must of necessity be taken care of. Going at the pace she is today, the American hen must be maintained in perfect strength and health at all times. Her system must be supplied with the proper nutrients; she must have the proper housing, the proper care, and a sufficient amount of exercise, in order to keep her wonderful mechanism in perfect working order. And it is in accomplishing this that Davis Poultry Food performs its mission. We do not ask you to take our word for it; in fact, you would be foolish to take any person's word for it, without having an opportunity to use your own judgment. There is nothing like knowing it for yourself, and this is exactly what we want you to do. Your money will be cheerfully refunded if you are not fully satisfied.

Davis Poultry Food is composed of the following standard ingredients, specially ground, prepared and mixed in our own factory:

- Pv. Ferri Oxide,
- Pv. Capsicum,
- Pv. Gentian,
- Pv. Ginger,
- Pv. Carbo Ligni,
- Pv. Sodium Sulphate,
- Pv. Sodium Chloride,
- Pv. Acid Phosphate,
- Pv. Ground Bone,
- Pv. Oxide Iron.

The full descriptions of these drugs which will be found on the following pages are taken from the United States Dispensatory, an official publication of the United States Government:

SEND ALL ORDERS TO SEARS, ROEBUCK & CO., CHICAGO, ILL.

- Sears, Roebuck & Co., Catalogue No. 65F130, Davis Poultry Food, 2-lb. package. Price **\$0.25**
- Sears, Roebuck & Co., Catalogue No. 65F131, Davis Poultry Food, 4-lb. package. Price **.50**
- Sears, Roebuck & Co., Catalogue No. 65F132, Davis Poultry Food, 8-lb. package. Price **1.00**
- Sears, Roebuck & Co., Catalogue No. 65F140, Davis Poultry Food, 25-lb. pail. Price **3.00**



DAVIS STOCK FOOD.

Why You Should Use Davis Stock Food.

First, let us explain that like Davis Poultry Food, Davis Stock Food is not a food in any sense of the word, and the word "food" is, in reality, a misnomer. You naturally ask, then, if such is the case, why we call it stock food. This is our explanation: Years, and almost centuries ago, there originated in England certain condiments and preparations which were put up and sold to raisers of live stock under the name of stock foods and poultry foods. Their value was soon recognized and their manufacture became one of the important industries of that country. They became known everywhere as stock foods and poultry foods, as the case might be. The custom of so calling them was ultimately adopted in America, and, from that day to this, condimental, digestive and corrective preparations have been sold by the manufacturers and purchased by the consumers under the name of stock food or poultry food. Inasmuch as this custom became so widely spread, we can see no benefit in trying to introduce a new name, and have preferred to follow the custom of years, instead of attempting to coin a new name for these time honored preparations.

Not a Food.

Instead of being a food, Davis Stock Food is a mixture of herbs, roots, barks and seeds, purely medicinal in character, having condimental, digestive and corrective properties and it has no intrinsic value of itself from a nutritive standpoint.

At this time we would also like to call your attention to the fact that Davis Stock

Food is not to be confused with the numerous other preparations offered under the guise or name of stock food. The original English stock foods, while perhaps more or less crude, gave such splendid results that as soon as they were introduced into this country numerous companies were formed for the manufacture of stock foods. The American stock raiser, ever willing and ready to improve his stock, was an easy prey for unscrupulous persons and companies who manufactured and put out under the name of stock food cheap and absolutely worthless mixtures, getting an outrageous price for them, and as a result of this there are thousands upon thousands of farmers in the United States today who have been victimized by the purchase of these worthless preparations, and the legitimate stock food industry has suffered as a result. Not that the American farmer who has a prejudice against stock foods can be blamed, for he has every reason for such prejudice. He had no way of knowing whether or not the article he was purchasing was one of merit other than to try it, and, trying it, he found it worthless. It is into such a field and under such conditions that Davis Stock Food comes. Just because there are one or a thousand worthless preparations is no reason for condemning the good ones. We know that



Send all orders to Sears, Roebuck & Co. 25-lb. pail, \$3.00
Davis Stock Food, Catalogue No. 65F120. Price, \$3.00

Davis Stock Food is honest all the way through; we know that it carries from three to ten times as much medication as anything offered the American farmer; we know that it is even superior to the stock foods of England and Scotland; and it is right that it should be, because this world is progressing every day. The knowledge of feeds and feeding, of drugs, of roots, herbs, barks, seeds, and their action on the digestive and other organs of animals, is much better understood now than it was even a decade ago, and all this, together with modern and up-to-date machinery, has made it possible to manufacture and place upon the market Davis Stock Food.

One thing that we do ask, however, is a fair and impartial trial. Davis Stock Food cannot accomplish its mission unless it is used with religious regularity. It cannot do the impossible. It cannot take the place of clean bedding, good housing and pure water, although it may in a measure correct the lack of the foregoing. The world was not made in a day, neither can Davis Stock Food transform an unhealthy and unthrifty animal into a perfectly healthy animal in a day. You would not expect your horse, your cow, or your hogs to thrive very long if they were but fed grain occasionally, and you, as a fair minded man, would not expect Davis Stock Food to do what we claim for it unless it is given an opportunity. Grant Davis Stock Food the same attention and privilege that you do your grain, and then watch for the results. It is for this reason that we would urge you to purchase 100 pounds of Davis Stock Food, so that you may have an opportunity of thoroughly testing it. One 2-pound package of Davis Stock Food contains approximately sixty-four feeds, or enough to feed one horse for twenty-one days. In a great many cases you will see a decided improvement within that period, in others it will take longer. A digestive system that has been disordered and working in an improper condition for years cannot be corrected in a day. A change is wrought slowly, and time is as necessary as medication. As a matter of fact, Davis Stock Food will not attain its highest efficiency with any animal until at the expiration of sixty to ninety days, and after that time it will do more than we claim for it.

SEND ALL ORDERS TO SEARS, ROEBUCK & CO., CHICAGO, ILL.
 Sears, Roebuck & Co., Catalogue No. 65F100, Davis Stock Food, 2-lb. package. Price... **\$0.25**
 Sears, Roebuck & Co., Catalogue No. 65F405, Davis Stock Food, 4-lb. package. Price... **.50**
 Sears, Roebuck & Co., Catalogue No. 65F110, Davis Stock Food, 8-lb. package. Price... **1.00**



Fig. 33

It is a well known and indisputable fact that the average digestibility of the American feed stuffs is between 55 and 60 per cent, providing the animal eating that grain is able to extract it; but it is also a well known fact that 80 to 90 per cent of the domestic animals today are incapable of extracting all the nutriment of the feed. Their digestive organs are in a deranged condition, and it is to correct this condition that Davis Stock Food came into existence. It is composed of roots, barks, herbs, and seeds, purchased by us in the crude form, and we import them in this shape from Spain, France, Italy, Austria, Germany, Russia, India, Africa and South America. Our reason for importing the majority of them is because of the fact that the American grown product is inferior in the majority of cases to the foreign article, and, although the foreign article costs several times as much, we consider it economy in the end.

Fennel is one of the best stomachics, digestants and carminatives known. Anise seed has a similar action and its value is recognized the world over. Gentian is without a peer as a bitter tonic and a digestant. Nux Vomica is one of the best of tonics and nerve stimulants. Santonica is unequaled and used the world over as a vermifuge and to kill worms. Podophyllum is a cholagogue cathartic, having a special action upon the liver. Acid phosphate is an article that we are having manufactured especially for us. It stimulates first the salivary glands and induces the flow of saliva, passing into the stomach it excites the secretion of the digestive juices. It is also one of the best intestinal antiseptics, and once absorbed exerts a specific action on the digestive organs and glands. Sulphur is a well known intestinal antiseptic and blood purifier. Sodium chloride is essential to the system. Charcoal, or carbo ligni, is an antiacid and an intestinal antiseptic. Ferri Sulphus builds and strengthens the entire system, and is essential in the production of good, rich, red blood.

There is no other stock food upon the market that can compare with Davis Stock Food; there are no other stock food manufacturers that would dare tell you their formulas. It is your right to know. It is within the power of the American stock raiser to compel all stock food manufacturers to print their formula. Why should you buy a "pig in a poke?" The manufacturer of an honest stock food has nothing to fear from printing his formula. If he refuses to do it you may draw your own conclusions.

While Davis Stock Food is primarily an appetizer, tonic, digestant, it will, in a great majority of cases, not only prevent, but cure, a great many of the diseases that the domestic animals are heir to. Its uses for the cure of diseases are thoroughly covered in this book.

Davis Stock Food is composed of the following ingredients, properly ground, mixed and prepared in our own factory

Pv. Fennel Seed,
 Pv. Anise Seed,
 Pv. Gentian,
 Pv. Nux Vomica,
 Pv. Santonica,
 Pv. Podophyllum,
 Pv. Acid Phosphate,
 Pv. Sulphur,
 Pv. Sodium Chloride,
 Pv. Carbo Ligni,
 Pv. Ferri Sulphus.

All of the foregoing ingredients are official in the United States Dispensatory, and the following descriptions of them are taken from the United States Dispensatory. Read them, study them, and then tell us if you do not think that no more ideal combination of roots, herbs, barks, and seeds than Davis Stock Food could be found.

GENTIANA, U. S. GENTIAN, BR.



Gentiana Plant.

Medical Properties and Uses.—Gentian possesses in a high degree the tonic powers of the simple bitters. It excites the appetite and invigorates digestion. In very large doses, however, it is apt to oppress the stomach, to irritate the bowels, and even to occasion nausea and vomiting. It has been known from the highest antiquity, and is said to have derived its name from Gentius, a king of Illyria. Many of the complex preparations handed down from the Greeks and Arabians contain it among their ingredients; and it enters into most of the stomachic combinations employed in modern practice. It may be used in all cases of pure debility of the digestive organs, or where a general tonic impression is required. Dyspepsia, atonic gout, amenorrhœa, hysteria, scrofula, and intermittent fever are among the many affections in which it has proved useful; but it is the condition of the stomach and of the system generally, not the name of the disease, which must be taken into consideration when prescribing it; and there is scarcely a complaint in which it cannot be advantageously given under all circumstances. It should be administered only in the form of preparation. A syrup may be prepared by forming a saccharated infusion by means of percolation, and incorporating

this at a boiling heat with simple syrup; or, perhaps, more eligibly, by dissolving 2 drams of the extract of gentian, and afterward 15 ounces of sugar in $\frac{1}{2}$ pint of water. The porous property of the root causes it to expand with moisture, and it has been employed as a substitute for sponge-tent in the enlargement of strictured passages.

"The root of *Gentiana lutea*, Linne (nat. ord. Gentianeae)." U. S. "The dried root of *Gentiana lutea*." Br.

Gentianae Radix, Br.; Gentian Root; *Radix Gentianae*, P. G.; *Radix Gentianae Rubrae* (vel *Luteae* vel *Majoris*); *Racine de Gentiane* (de *Gentiane jaune*), *Gentiane jaune*, Fr.; *Enzian*, *Enzianwurzel*, *Bitterwurzel*, *Rother Enzian*, G.; *Genziana*, It.; *Genciana*, Sp.

Gen. Ch. Corolla one-petaled. Capsule two-valved, one-celled, with two longitudinal receptacles. Willd.

Gentiana lutea. Willd. Sp. Plant. i. 1331; Qoody. Med. Bot. p. 273, 95; Carson, *Illust. of Med. Bot.* ii. 12, pl. 60. Yellow Gentian is among the most remarkable of the species which compose this genus, both for its beauty and great comparative size. From its thick, long, branching, perennial root, an erect, round stem rises to the height of 3 or 4 feet, bearing opposite, sessile, ovate, acute, five-nerved leaves of a bright green color, and somewhat glaucous. The lower leaves, which spring from the root, are narrowed at their base into the form of a petiole. The flowers are large and beautiful, of a yellow color, peduncled, and placed in whorls at the axils of the upper leaves. The calyx is monophyllous, membranous, yellowish, and semi-transparent, splitting when the flower opens, and reflected when it is fully expanded; the corolla is rotate, and deeply divided into five or six lanceolate, acute segments; the stamens are five or six, and shorter than the corolla. This plant grows among the Apennines, the Alps, the Pyrenees, and in other mountainous or elevated regions of Europe. The root is the only part employed.

Several other species possess analogous virtues, and are used for similar purposes. The roots of *G. purpurea* and *G. punctata*, inhabiting the same regions as *G. lutea*, and of *G. pannonica*, growing in Austria, are said to be often mingled with the official, from which they are scarcely distinguishable. The *G. macrophylla* of Pallas is used in Siberia; one indigenous species, *G. catesbaei*,* growing in the southern states, formerly had a place in the secondary catalogue of the U. S. Pharmacopœia, and is reputed to be but little inferior to the official species. *G. quinqueflora*, growing throughout the Northern and North-western States, is said to be much used in domestic practice.

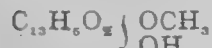
**Gentiana Catesbaei*. The blue gentian has a perennial, branching, somewhat fleshy root, and a simple, erect, rough stem, rising 8 or 10 inches in height, and bearing opposite leaves, which are ovate-lanceolate, acute, and rough on their margin. The flowers are of a palish blue color crowded, nearly sessile, and axillary or terminal. The divisions of the calyx are linear-lanceolate, and longer than the tube. The corolla is large, ventricose, plaited, and divided at its border into ten segments, of which the five outer are more or less acute, the five inner bifid and fringed. The number of stamens is five, and the two stigmas are seated on the germ. The capsule is oblong, acuminate, with two valves, and a single cell. *G. catesbaei* grows in the grassy swamps of North and South Carolina, where it flowers from September to December. It was named by Walter and Elliot in honor of Catesby, by whom it was delineated nearly a century ago. The dried root is said to have at first a mucilaginous and sweetish taste, which is soon succeeded by an intense bitterness, approaching nearly to that of the official gentian. Alcohol and boiling water extract the virtues, and the tincture and decoction are even more bitter than the root in substance. It may be given in powder in the dose of 15 to 30 grains, or in the form of extract, infusion, wine, or tincture, which may be prepared in the manner directed for the similar preparations of foreign gentian.



Gentian Root.

Properties.—As found in commerce, gentian is in pieces of various dimensions and shape, usually of considerable length, consisting sometimes of longitudinal slices, sometimes of the root cut transversely, twisted, wrinkled externally, sometimes marked with close transverse rings of a grayish brown color on the outside, yellowish or reddish within, and of a soft, spongy texture. It is officially described as occurring "in nearly cylindrical pieces of longitudinal slices, about 35mm. thick, the upper portion closely annulate, the lower portion longitudinally wrinkled; externally deep yellowish brown; internally lighter; somewhat flexible and tough when damp; rather brittle when dry; fracture uneven; the bark rather thick, separated from the somewhat spongy medullium by a black cambium line; odor peculiar, faint, more prominent when moistened; taste sweetish and persistently bitter." U. S. There are no distinct pith, liber-cells, starch granules, or raphides. (For further details, see P. J. Tr., July, 1872, p. 42.) The odor is feeble, but decided and peculiar. The taste is slightly sweetish and intensely bitter, without being nauseous. The powder is yellowish. Water and alcohol extract the virtues and taste of the root.

Kromayer, in 1862, first obtained the bitter principle of gentian in a state of purity, and gave it the name of gentiopicrin, and the formula $C_{20}H_{30}O_{12}$. It is a neutral body, crystallizing in colorless needles, which readily dissolve in water. It is soluble in spirit of wine, but in absolute alcohol when aided by heat; it does not dissolve in ether. A solution of caustic soda forms with a yellow solution. Under the influence of dilute acids, gentiopicrin is resolved into glucose and an amorphous yellowish brown neutral substance named gentiogenin. Fresh gentian roots yield about 1-10 per cent of gentiopicrin. Another constituent is gentianin or gentisin, $C_{14}H_{10}O_6$. It forms tasteless, yellowish prisms, subliming with partial decomposition at a temperature over 300 degrees C., sparingly soluble in alcohol, and with alkalis yields intensely yellow, crystallizable compounds, easily decomposed by carbonic acid. Von Kostanecki (A. J. P., 1891, p. 192), by boiling gentisin with hydriodic acid, succeeded in demethylating it, and so obtained gentisein, $C_{12}H_8O_5$, which crystallizes with $2H_2O$ in fine straw colored needles; these become anhydrous at 100 degrees C. A triacetyl derivative was then formed from this gentisein. Gentisin is therefore the methyl ether of gentisein, and can be written



OH. Hlasiwetz and Habermann showed, in 1875, that when gentianin was melted with caustic potash it yielded phloroglucin, $C_6H_3(OH)_3$, and oxysalicylic acid, $C_6H_3(OH)_2COOH$. The latter was at first called gentianic or gentisinic acid. Prof. Maisch believes that tannin is absent from gentian root, and states that the dark olive green coloration observed when ferric chloride is added to its preparations is due to gentisic acid (A. J. P., 1876). Ville (A. J. P., 1877) and Davies (P. J. Tr., 1879) maintain that there is a small quantity of tannin in gentian root. Prof. Patch (A. J. P., 1876) found that an alcoholic solution of an ethereal extract of gentian yielded a dark green coloration with ferric salts, but if the alcoholic solution was diluted with water it yielded no precipitate with gelatin. Subsequently (Proc. A. P. A., 1881) he showed there was a principle associated with the resinous matter in gentian (but which was not isolated in a state of purity) that produced the reactions of a tannin, viz., a greenish black color with ferric chloride, and precipitates with tartar emetic, cinchonidine sulphate, and gelatin. M. Louis Magnes found in the root, when perfectly dried at 100 degrees C (212-degrees F.), 15 per cent of glucose, and 12 per cent in the root in its ordinary state. (A. J. P., pp. 333-4.) When gentian is macerated in cold water, it undergoes the vinous fermentation; in consequence of the presence of this saccharine principle. From the fermented infusion a spirituous liquor is obtained by distillation, which, though bitter and unpleasant to the smell, is said to be relished by the Swiss and Tyrolese. A. Meyer (Pharm. Centralb., 1882, May) obtained a sweet principle, which he called gentianose, $C_{16}H_{26}O_{11}$, by precipitating the filtered juice with alcohol, treatment with ether, and crystallization from alcohol. It does not reduce Fehling's solution. Infusion of gentian is precipitated by tannic acid and the soluble salts of lead, but is compatible with the salts of iron.



Fennel Plant and Seed.

FOENICULUM, U. S. (BR.) FENNEL.

Medical Properties and Uses.—Fennel seed was used by the ancients. It is one of our most grateful aromatics, and in this country is much employed as a carminative, and as a corrigent of other less pleasant medicines, particularly senna and rhubarb. It is recommended for these purposes by the absence of any highly excitant property. An infusion may be prepared by introducing 2 or 3 drams of the seeds into 1 pint of boiling water. The dose of the bruised or powdered seeds is from 1 scruple to $\frac{1}{2}$ dram. (1.3-1.95 Gm.) In infants the infusion is frequently employed as an enema for the expulsion of flatus.

"The fruit of *Foeniculum capillaceum*, Gilbert (nat. ord. Umbelliferae)." U. S. "The dried fruit of cultivated plants of *Foeniculum capillaceum*, Gillib. (*Foeniculum vulgare*, Gaert)." Br.

Foeniculi Fructus, Br.; Fructus Foeniculi, P. G.; Fennel Fruit (Seed), Sweet Fennel Fruit; Fenouil, Fruits (Semences) de Fenouil, Fr.; Fenchel, Fenchelsamen, G.; Finnochio, It.; Hinojo, Sp.

The plant producing fennel seed was attached by Linnaeus to the genus *Anethum*, but was separated from it by De Candolle, and placed, with three or four others, in a new genus styled *Foeniculum*, which has been generally adopted by botanists. The *Anethum* *Foeniculum* of Linnaeus embraced two varieties, the common or wild fennel, and the sweet fennel; the latter being the plant usually cultivated in the gardens of Europe. These are considered by De Candolle as distinct species, and named respectively *Foeniculum vulgare* and *Foeniculum dulce*, but the correctness of the opinion of the great Swedish botanist is now generally admitted.

Gen. Ch. Calyx a tumid obsolete rim. Petals roundish, entire, involute, with a squarish blunt lobe. Fruit nearly taper. Half fruits with five prominent bluntly keeled ridges, of which the lateral are on the edge, and rather broadest. Vittae single in the channels, two on the commissure. Involucre none. Lindley.

Foeniculum capillaceum. Gillib. Fl. Lithuan., iv. 1782. *Foeniculum vulgare*. De Cand. Prodrum., iv. 142. *Anethum Foeniculum*. Linn. Common Fennel has a biennial or perennial tapering root, and an annual, erect, round, striated, smooth, green, and copiously branching stem, which usually rises 3 or 4 feet in height. The leaves, which stand alternately at the joints of the stem, upon membranous striated sheaths, are many times pinnate, with long, linear, pointed, smooth, deep green leaflets. The flowers are in large, flat, terminal umbels, with from thirteen to twenty rays, and destitute both of general and partial involucre. The corolla consists of five petals, which, as well as the stamens, are golden yellow. The fruit is ovate, rather less than two lines in length by about a line in breadth and of a dark color, especially in the channels. The plant is a native of Europe, growing wild upon sandy and chalky ground throughout the continent, and is also abundant in Asia, extending, possibly, as far as China. The variety *F. officinale* of Merat and De Lens is chiefly characterized by its fruit being twice as long as that of the ordinary plant, and also a little curved, of a less dark color, with prominent ridges, and a persistent peduncle. It is sweeter and more aromatic than common fennel seed.

F. dulce. De Cand. Prodrum. iv. 142. Sweet Fennel bears a general resemblance to *F. vulgare*, but differs in having its stem somewhat compressed at the base, its radical leaves somewhat distichous, and the number of rays in the umbel only from six to eight. It is also a much smaller plant, being only about a foot high; its flowers appear earlier; and its young shoots or turions are sweeter and edible. In Italy it is cultivated as a garden vegetable, the shoots being eaten boiled or as a salad.

The roots of fennel were formerly employed in medicine, but are generally inferior in virtues to the fruit, which is now the only official portion. It is stated that the manufacturers of the oil usually distil the whole plant. Commerce is partly supplied from the product of our own gardens; but much the larger portions of the medicine is imported from Europe, and chiefly, we have been informed, from Germany. During the winter of 1879 much of the seed in the German market was adulterated with fennel seed partially deprived of its oil. The fennel seed cultivated here is sweeter and more aromatic than that from abroad, probably in consequence of its greater freshness. Fennel seeds (half fruits) are oblong oval, from one to three or four lines in length, flat on one side, convex on the other, not unfrequently connected by their flat surfaces, straight or slightly curved, brownish or of a dark grayish green color, with five prominent, obtuse, yellowish ribs or ridges on the convex surface. On inspection the vittae, or oil tubes, are seen to be very well developed and are situated one between each pair of ridges and two upon the flat face of each mericarp. There are two varieties of fennel seed—one, which is probably the product of the wild fennel growing in the south of France, is from one to two lines long, dark colored, rather flat, almost always separate, and without footstalks; the other is from three to five lines in length, lighter colored, with much more prominent ridges, often conjoined by their flat surface, and very frequently provided with a footstalk. They do not differ essentially in aromatic properties. The odor of fennel seed is fragrant, its taste warm, sweet, and agreeably aromatic. It yields its virtues to hot water, but more frequently to alcohol. The essential oil may be separated by distillation with water. (See *Oleum Foeniculi*.) From 960 parts of the seed Neumann obtained 20 parts of volatile and 120 of fixed oil.

ANISUM, U. S. (BR.) ANISE.

Medical Properties and Uses.—Anise is a grateful aromatic carminative, and is supposed to have the property of increasing the secretion of milk. It has been in use from the earliest times. In Europe it is much employed in flatulent colic; and as a corrigent of griping or unpleasant medicines; but in this country fennel seed is preferred. Anise may be given bruised, or in powder, in the dose of 20 or 30 grains (1.3-1.95 Gm.) or more. The infusion is less efficient. The volatile oil may be substituted for the seeds in substance. Much use is made of this aromatic for imparting flavors to liquors.

“The fruit of *Pimpinella Anisum*, Linne (nat. ord. Umbelliferae).” U. S. “The dried fruit of *Pimpinella Anisum*. Linn.” Br.

Anisi Fructus, Br.; Fructus (Semen) Anisi, s. Anisi vulgaris; Aniseed, E.; Anis, Anis vert, Graines d'Anis, Fr.; Anissame, Anis, G.; Semi d'Aniso, It.; Simiente de Anis, Sp.; Anison, Ar.

Gen. Ch. Fruit ovate-oblong. Petals inferior. Stigma nearly globular. Willd. *Pimpinella anisum*. Willd. Sp. Plant. i. 1473; B. and T. 122. This is an annual plant, about a foot in height, with an erect, smooth, and branching stem. The leaves are petiolate, the lower roundish cordate, lobed, incised serrate, the middle pinnate lobed with cuneate or lanceolate lobes, the upper trifid, undivided, linear. The flowers are white, and in terminal compound umbels, destitute of involucre.

The anise plant is a native of Egypt and the Levant, but has been introduced into the south of Europe and is cultivated in various parts of that continent. It is also cultivated occasionally in the gardens of this country. The fruit is abundantly produced in Malta and Spain; in Romagna, in Italy, whence it is largely exported through Leghorn, and in Central and Southern Russia. The Spanish is smaller than the German or French, and is usually preferred; the Russian fruit is very short. It is said also to be extensively cultivated in India and South America, although we are not aware that the product ever comes into American commerce.

It is one of the oldest aromatics, having been spoken of by Theophrastus and cultivated in the imperial German farms of Charlemagne. In 1305, Edward I. granted a patent giving the right to levy tolls upon it at the Bridge of London for the purpose of repairing the bridge.



Anise Plant and Seed.

Anise seeds (botanically, fruit) are about a line in length, oval, striated, somewhat downy, attached to their footstalks, and of a light greenish brown color, with a shade of yellow. "About 4 to 5 mm. long, ovate, compressed at the sides, grayish, finely hairy, and consisting of two mericarps, each with a flat face, and five light brownish, filiform ridges, and about fifteen oil tubes, which can be seen in a transverse section by the microscope." U. S. Their odor is fragrant, and increased by friction; their taste, warm, sweet, and aromatic. These properties, which depend upon a peculiar volatile oil, are imparted sparingly to boiling water, freely to alcohol. The volatile oil exists in the envelope of the seeds, and is obtained separate by distillation. (See *Oleum Anisi*.) Their internal substance contains a bland fixed oil. By expression, a greenish oil is obtained, which is a mixture of the two. The seeds are sometimes adulterated with small fragments of argillaceous earth, which resembles them in color; and their aromatic qualities are occasionally impaired by a slight fermentation, which they are apt to undergo in the mass, when collected before maturity. When examined by the microscope, anise is seen to contain a very great but variable number of small oil tubes, which are well represented in the accompanying figure, from fifteen to thirty to each mericarp. The epidermis is supplied with short, simple hairs, easily detached in making a section, and not represented in the cut.

A case of poisoning is on record from the accidental admixture of the fruits of *Conium maculatum*, which bear some resemblance to those of anise, but may be distinguished by their crenate or notched ridges and the absence of oil tubes; by their mericarps being smooth, grooved upon the face, and having crenate or notched ridges with wrinkles between them; and especially by the absence of oil tubes. The conium fruits are, moreover, broader in proportion to their length, and are generally separated into half fruits (or single mericarps), while those of anise are whole (double mericarps).

Star aniseed, the *Cardamomum Siberiense* or *Annis de Siberie* of the Seventeenth Century and the *badiane* of the French writers, is the product of the *Illicium anisatum*, and is fully described under the heading *Illicium*. They contain about 4 per cent of a volatile oil very closely resembling that of anise. There are no known chemical differences between these oils, although dealers distinguish them by their smell and taste.

Dr. Ruschenberger, U. S. N., has shown that oil of anise has a remarkable power of deodorizing potassium sulphide; a drop of the oil having entirely deprived of offensive odor a dram of lard with which 5 grains of the sulphide had been incorporated. (*Am. Journ. of Med. Sci.*, N. S. *xlvi*. 419.)

FERRI SULPHAS, U. S. BR. FERROUS SULPHATE.

Fe SO₄ .7H₂O; 277.42.

Fe SO₄ .7H₂O; 277.9.

General Therapeutic Effects of Iron.—The preparations of iron are preeminently tonic, and peculiarly well fitted to improve the quality of the blood when impoverished from any cause. Hence they are useful in diseases characterized by debility, especially when the consequence of inordinate discharges. The diseases in which they are usually employed are chronic anemia, chlorosis, hysteria, scrofula, rickets, passive hemorrhages, and neuralgia. They are contra-indicated in all inflammatory diseases, producing, when injudiciously employed, heat, thirst, headache, difficulty of breathing, and other symptoms of an excited circulation. In order to understand their effort in improving the blood, it must be borne in mind that this fluid always contains iron, as an essential constituent of the red corpuscles. The amount in ten thousand parts of blood, according to different authorities, is 2.3 parts. (La Canu), 2.4 (Denis), 5.5 (Becquerel and Rodier), 8.7 (Poggiala), mean 4.7. In anemia, the blood is deficient in iron, not because the red corpuscles contain less of the metal, for they, individually considered, always contain the normal quantity, but because there are fewer of them. (Becquerel and Rodier.) The questions here arise, which are the preparations of iron best adapted to promote the formation of the red constituent of the blood, and what are the conditions of their administration most favorable to their efficient action? According to M. Bouchardat, the preparations most easily assimilated are metallic iron and the ferrous oxide, and when the latter is in saline combination it should be united either with carbonic acid or with some organic acid. He holds that when the iron is combined with a mineral acid, such as the sulphuric or phosphoric, the preparation acts solely as an astringent. Quevenne did not go so far ahead as this, but believed that the mineral acid salts were not well adapted for assimilation, and that they were less so in proportion to their astringent power. Quevenne laid it down as a rule, that when the iron preparations are given with the view of improving the blood, they should be taken with the meals, and not on an empty stomach. The juice during digestion is acid and has been shown by the experiments of Quevenne to be in a favorable state for dissolving iron. The ferruginous preparations, it is true, were found to be unequally soluble; for, while iron filings were freely soluble, ferric subcarbonate was but slightly attacked. It was observed that the acidity of the gastric juice was but little diminished by the solution of the iron; which fact can be explained only by supposing that the presence of the metal caused a nearly proportional increase of the acid secretion. Assuming these observations to be accurate, it is easy to perceive why the ferruginous preparations should be taken with the feed, selecting, of course,

those most soluble in the gastric juice. The digested iron, being intimately blended with the digested feed, is in a favorable state for secondary assimilation. In the use of ferruginous preparations it is necessary to persevere for several months in order to reap the fullest benefit. Even after the cure appears to be accomplished, it is safest to continue them, in diminishing doses, for a time.

Sulphate of Iron, Green Vitriol; Ferrum Sulfuricum Purum, P. G.; Sulfas Ferrosus, Ferrum Vitriolatum Purum, Vitriolum Martis Purum. Ferrous Sulphate; Sulfate (Protosulfate) de Fer, Sulfate Ferreux, Fr.; Schwefelsaures Eisenoxydul, G.

"Ferrous Sulphate should be kept in well stoppered bottles." U. S. "Take of Iron Wire 4 ounces (avoirdupois); Sulphuric Acid 4 fluid ounces (Imperial measure); Distilled Water 1½ pints (Imp. meas.). Pour the water on the iron placed in a porcelain dish, add the Sulphuric Acid, and, when the disengagement of gas has nearly ceased, boil for ten minutes. Filter now through paper, and, after the lapse of twenty-four hours, separate the crystals which have been deposited from the solution. Let these be dried on filtering paper placed on porous bricks, and preserved in a stoppered bottle." Br.

The object of this process is to make a pure ferrous sulphate by direct combination. Sulphuric acid, in a concentrated state, acts but imperfectly on iron; but when diluted, a vigorous action takes place, the oxygen of the water converts the metal into an oxide, with which the sulphuric acid unites, and hydrogen is evolved. The theoretical quantities for mutual reaction are fifty-six of iron and ninety-eight of acid. This proportion is one part of iron to one and three-quarters of acid. The British Council uses an excess of acid, the weight of acid taken being 7.38 avoirdupois ounces, instead of 7. An excess of iron, however, is desirable, as it tends to secure the production of a perfect ferrous sulphate. A process for this salt was given in the U. S. P. 1870, which was based upon the method of Bonsdorff. This chemist found that when a perfect ferrous sulphate was formed in solution by heating dilute sulphuric acid with an excess of iron, it might be crystallized free from sesquioxide, provided a little excess of sulphuric acid were added to the liquid before filtration, in order to prevent the formation of any sesquioxide during the process, at the same time avoiding, as much as possible, the contact of the air. Hence the directions in the former U. S. formula to acidulate with sulphuric acid, to cause the funnel to touch the bottom of the receiving vessel, which avoids the dropping of the liquid through the air, and to cover the vessel containing the concentrated liquid when it is set aside to crystallize.

Properties.—Ferrous sulphate is in the form of "large, pale bluish green, monoclinic prisms, without odor, and having a saline, styptic taste." Efflorescent in dry air, and, on exposure to a moist atmosphere, rapidly absorbing oxygen, and becoming coated with brownish yellow, basic, ferric sulphate. Soluble in ¼ part of water at 15 degrees C. (59 degrees F.), and in 0.3 parts of boiling water; insoluble in alcohol. When slowly heated to 115 degrees C. (239 degrees F.), the crystals fall to powder, and lose 38.84 per cent of their weight (6 molecules of water of crystallization). The aqueous solution of the salt has an acid reaction, and, even when highly diluted, gives with potassium ferricyanide test solution a blue color or precipitate, and with barium chloride test solution a white precipitate insoluble in hydrochloric acid. If 1 Gm. of the salt be dissolved in about 25 C.c. of water, the solution heated to boiling, oxidized with nitric acid, and then mixed with a slight excess of ammonia water, the filtrate from the reddish brown precipitate should be colorless, and should not be affected by hydrogen sulphide test solution (absence of copper, zinc, etc.). If another portion of the filtrate be evaporated to dryness, and then ignited, it should not leave more than a trace of residue (limit of salts of the fixed alkalis). If 1.39 (1.3871) Gm. of the salt be dissolved in about 25 C.c. of water, and the solution acidulated with sulphuric acid, not less than 50 C.c. of potassium permanganate decinormal volumetric solution should be required to impart to the liquid a permanent pink color (each C.c. of the volumetric solution indicating 2 per cent of crystallized Ferrous Sulphate)." U. S. As prepared by Bonsdorff's method, ferrous sulphate is blue verging to green. When it becomes more green than blue, or entirely green, an indication is afforded that it contains some sesquioxide. By exposure to the air the crystals absorb oxygen, and become first green, and ultimately covered with a yellow efflorescence of subsulphate, insoluble in water. Sometimes the crystals are quite permanent when made by Bonsdorff's method, owing to the slight excess of acid which they contain. The aqueous solution is bluish green; but by standing it attracts oxygen, and becomes first green and then reddish, depositing, in the meantime, a portion of sesquisulphate, having the composition $\text{Fe}_2(\text{SO}_4)_3 + \text{Fe}_2\text{O}_3 + 8\text{H}_2\text{O}$. (Wittstein, Chem. Gaz., May 15, 1849; from Buchner's Report.) At a red heat it loses its acid, and is converted into the anhydrous ferric oxide called colcothar. It is incompatible with the alkalis and their carbonates, soaps, lime water, calcium and barium chlorides, sodium borate and phosphate, silver nitrate, and lead acetate and subacetate. It is decomposed also by astringent vegetable infusions, the tannic and gallic acids of which form, if any sesquioxide be present, a black compound of the nature of ink. The extent to which this change lessens the activity of the salt is not well ascertained. Ferrous sulphate, as found in commerce, is often the impure commercial sulphate, which is not fit for medicinal use. The perfectly pure salt is precipitated white by potassium ferrocyanide; but that of ordinary purity gives a greenish precipitate, more or less deep, with this test, owing to the presence of some ferric oxide. Copper may be detected by immersing in the solution a bright piece of iron, on which a cupreous film will be deposited. Both copper and zinc may be discovered by oxidizing the iron by boiling the solution of the salt with nitric acid and then precipitating the iron by an excess of ammonia. If the filtered solution be blue, copper is present; and if it contains zinc, this will be separated in flakes of white oxide on expelling the excess of ammonia by ebullition.

It is often desirable to protect ferrous sulphate against the oxidation to which it is liable on exposure. Sugar acts as a preservative in the case of this salt, as in that of ferrous iodide. It may be added to the solution, or incorporated with the sulphate in substance. M. E. Latour has given a formula for crystallizing the salt with sugar. Mr. Geo. Welbourn has found a small lump of camphor, wrapped in tissue paper and placed in the bottle with the sulphate, to prevent its oxidation. (P. J. Tr., May, 1868, p. 537.) M. Pavesi, of Mortara, effects the same object by incorporating it with an equal weight of gum arabic, by evaporating a joint solution of the two substances with a gentle heat. (Journ. de Pharm., 4e ser., iii. 49.)

NUX VOMICA, U. S. (BR.) NUX VOMICA.

Medical Properties.—On account of its stimulant effect upon the gastric mucous membrane, and of its tendency to excite the vaso-motor and motor centers of the spinal cord, and thereby increase the activity of the circulation and the general systemic tone, nux vomica is a very valuable tonic, which may be given along with iron and simple bitters.

As a respiratory stimulant nux vomica is very valuable in both subacute and chronic bronchitis, especially in old and feeble subjects, in advanced pneumonia, in narcotic poisoning.

Owing to its tendency to increase the activity of the muscular fibers, it is a valuable addition to laxative medicines where there is reason to suspect relaxation of the muscular coat of the bowels.



Nux Vomica Plant and Berry.

The seeds are circular, about $\frac{3}{4}$ inch in diameter, and two lines in thickness, flat or slightly convex on one side, and concave on the other, with a slight ridge extending from the center of one side to the edge. They are thickly covered with fine, silky, shining, ash colored or yellowish gray hairs, springing from, and indeed composed of elongated cells of a thin fragile coating of testa, which closely invests the interior nucleus or kernel. This is very hard, horny, usually whitish and semi-transparent, sometimes dark colored and opaque, and very difficult of pulverization. It is composed chiefly of a hard, horny albumen, which on section is seen to be formed of numerous small parenchymatous cells. In a fissure in the center lies the embryo. It is about $\frac{1}{2}$ inch long, with a club shaped radicle and two cordate, five to seven nerved cotyledons. The powder is yellowish gray, and has a faint sweetish odor. The seeds are destitute of odor, but have an acrid, very bitter taste, which is much stronger in the kernel than in the investing membrane. They impart their virtues to water, but more readily to diluted alcohol.

SANTONICA, U. S. (BR.) SANTONICA. (LEVANT WORMSEED.)

Actions and Uses.—Santonin is an effectual vermicide, particularly destructive to round and thread worms. Santonin is excreted by the kidneys as an obscure product of its oxidation in the system, and causes slight diuresis. It colors acid urine greenish yellow, and alkaline urine red or purple.

“The unexpanded flower heads of *Artemisia pauciflora*, Weber (nat. ord. Compositae).” U. S. “The dried unexpanded flower heads or capitula of *Artemisia maritima*, var. *Stechmanniana* (*A. pauciflora*, Weber).” Br.

“The seed of *Strychnos Nux Vomica*, Linne (nat. ord. Loganiaceae).” “The seeds of *Strychnos Nux Vomica*, Linne.” Br.

Semen Strychni, P. G.; Semen Nucis Vomicae; Poison Nut, Quaker Buttons; Noix Vomique, Fr.; Krahenaugen, Brechnusse, G.; Noce Vomica, It.; Nuez Vomica, Sp.

Gen. Ch. Corolla five-cleft. Berry one-celled, with a ligneous rind. Willd.

Strychnos nux vomica. Willd. Sp. Plant. i. 1052; B. & T. 178. This tree is of a moderate size, with numerous strong branches, covered with a smooth, dark gray bark. The young branches are long, flexuous, smooth, and dark green, with opposite, roundish oval, entire, smooth, and shining leaves, having three or five ribs, and short footstalks. The flowers are small, white, funnel shaped and in terminal corymbs. The fruit is a round berry, about as large as an orange, with a smooth, yellow or orange colored, hard, fragile rind, and many seeds in a juicy pulp. It has frequently been asserted that the pulp is innocuous; but the experiments and analyses of Fluckiger and Hanbury, and of Dunstan and Short (P. J. Tr., xv. 1), prove that it contains strychnine. The latter have also proved by chemical examination that of the commercial varieties of nux vomica Bombay seed stands first, then Cochin, and lastly Madras. (P. J. Tr., 1883, p. 1053.)

The tree is a native of the East Indies, growing in Bengal, Malabar, on the Coromandel Coast, in Ceylon, in many islands of the Indian Archipelago, in Cochin-China, and in other neighboring countries. The wood and root are very bitter, and are employed in the East Indies for the cure of intermittents. The radices colubrinae and lignum colubrinum of the older writers, long known in Europe as narcotic poisons, have been ascribed to this species of *Strychnos*, under the impression that it is identical with *Strychnos colubrina*, to which Linnaeus refers them. They have been ascertained by Pelletier and Caventou to contain a large quantity of strychnine. The bark is said by Dr. O'Shaughnessy to answer exactly to the description given by authors of the false *Angustura*, and, like that, to contain a large quantity of brucine. The identity of the two barks has been confirmed by Dr. Pereira, from a comparison of specimens. (See *Cuspariae Cortex*.)

European Wormseed; Santonici Semen, Semen Cynae, Semen Contra; Flores Cinae, P. G.; Semne Sanctum; Barbotine, Semencine, Fr.; Wurmsamen, Zittwersamen, G.

*Artemisia maritima** is a small, semi-shrubby perennial, from whose oblique, knotted rootstalks arise numerous leafy shoots and flowering stems. The glabrous and woody stems bear on their many branches numerous small (1 inch long) bi-to multipinnatifid leaves, whilst the leaves of the flowering stems are very minute, the upper ones simple. The flower heads are small, numerous, 1-10 inch long, with twelve to eighteen involucre scales, and from three to five flowers. The plant varies very greatly, and several species have been made out of its varieties. The form whose floral buds are said to resemble most closely the commercial drug has been named *A. cina* by Berg and Schmidt (t. 29, c.), and *A. pauciflora* by Weber. Following Bentley and Trimen, 157, the revisers of the recent U. S. P. have recognized the specific distinctness of the variety and adopted the name given by Weber; but the propriety of this seems doubtful, since the researches of the Russian botanists Besser and Ledebour indicate that the forms are not specifically distinct, but are merely varieties of one plant, which has an extremely wide distribution in the Northern Hemisphere; from the old marshes of the British Islands it has spread along the coasts of the Baltic and the Mediterranean and eastward over the saline soils in Hungary, through Southern Russia and Central Siberia, to Chinese Mongolia. In European commerce there are two kinds of wormseed, one called Aleppo, Alexandria, or Levant wormseed, the other Barbary wormseed. The Barbary wormseed is thought by some to be derived from *Artemisia judaica*, by others from *A. sieberi*† of Besser (*A. glomerata* of Sieber), and from *A. ramosa* (C. Smith), all of which grow in Palestine and Arabia. It consists of broken peduncles, having the calyx sometimes attached to their extremity. The calyx is also sometimes separate, consisting of very small linear obtuse leaflets. The flowers are wanting, or are in the shape of minute globular buds. All these parts are covered with a whitish brown, which serves to distinguish this variety from the wormseed of the Levant. It is, moreover, lighter and more colored than the latter. Its smell and taste are the same. The Levant wormseed is the santonica of the two Pharmacopoeias. It is officially described as "from 2 to 4 mm. long, oblong-ovate, obtuse, smooth, somewhat glossy, grayish green, after exposure to light, brownish green, consisting of an involucre of about twelve to eighteen closely imbricated, glandular scales with a broad midrib, enclosing four or five rudimentary florets; odor strong, peculiar, somewhat camphoraceous; taste aromatic and bitter." U. S.

Of late years most of the wormseed of commerce has come from the steppes of the northern portion of Turkestan to the great Niznee-Novgorod fair, whence it finds its way to Moscow and Western Europe. The export from this region is said to have reached 1,600 tons annually, but has largely declined, because the conquest of Turkestan by Russia led to the establishment in Orenburg of large factories for the manufacture of santonin, which is now sent thence into commerce. The yearly consumption of santonin throughout the world is estimated at about twenty-five tons, and of this at least 12 tons are produced in the factories just spoken of. The santonin in the plants is said to reach its maximum proportion in July and August, and to disappear immediately after the flowering.

Wormseed contains a volatile oil, but it owes its efficiency to santonin‡. (See Santoninum.) The essential oil of wormseed, according to Wallach (Ann. der Ch. und Pharm., 225, p. 314, and p. 227, 277), is mostly made up of cineol, $C_{10}H_{18}O$, which is isomeric with borneol, and seems to be identical with the cajuputol of cajuput oil, and which on proper treatment yields a terpene, $C_{10}H_{18}$, cinene, identical with cajuputene. Wormseed is rarely used in this country in substance. The dose is from 10 to 30 grains (0.65-1.95 Gm.).

SULPHUR PRAECIPITATUM, U. S. BR. PRECIPITATED SULPHUR.

S; 31.98.

S; 32.

Medical Properties and Uses.—Sulphur is a laxative, diaphoretic, and resolvent. It is supposed to be rendered soluble by the soda of the bile. M. Mialhe teaches that it is carried into the circulation by the fatty matters in the alimentary canal, which dissolve it. (Med. Times and Gaz., June, 1868, p. 642.) It evidently passes off by the pores of the skin, as is shown by the fact that silver worn in the pockets of patients under a course of it becomes blackened with a coating of sulphide. The stools which it occasions are usually semi-solid, and it is gentle in its operation, unless it contains a good deal of acid, when it may cause griping; the liability of the sublimed sulphur to contain acid renders it less eligible for exhibition than the washed sulphur, from which all acidity is removed. **The diseases in which sulphur is principally used are hemorrhoids, atonic gout, chronic rheumatism, chronic catarrh and asthma.** It has also been given as an antiperiodic, being considered particularly applicable to cases in which the apyrexia is incomplete. Applied locally it is a specific in scabies. It is sometimes applied as an air

*Messrs. Heckel and Schlagdenhauffen (Comptes-Rendus, 804) find that *Artemisia gallica* contains santonin, essential oil, and probably an alkaloid.

†*A. sieberi* is in all probability, however, but a variety of the very variable *A. herba-alba*, which is used by the Arabs under the name of "chili" as a vermifuge, and in which M. Battandier found two resins and a large quantity of essential oil, but no santonin.

‡Ehlinger's Process for valuing Santonica. Five parts of santonica and one part of milk of lime were bottled for two hours in a considerable quantity of dilute alcohol and the liquid poured off after cooling; this treatment was repeated at least twice more, and the alcohol was then distilled off from the united extracts. The residual liquid was then saturated in the cold with carbonic acid, filtered off from the precipitate after standing some hours, and the filtrate evaporated to dryness. The residue was triturated with animal charcoal and alcohol of specific gravity 0.935, and the paste rinsed into a retort, where it was digested with a measured quantity of alcohol. After boiling, the contents of the retort were thrown on a filter, washed with hot alcohol, and the alcohol driven off from the filtrate, from which, after some hours, crystals of santonin separated. (P. J. Tr., 1886, p. 449.)

bath, in the form of sulphurous acid gas, the head being protected from its effects. It has been used to a considerable extent in diphtheria, the flowers being blown by means of a tube, or a little cone of paper like a lamp lighter, upon the fauces from four to six times a day. The external use of sulphur is strongly recommended by Dr. O'Connor, of London, in sciatica and chronic articular rheumatism. The limb affected is covered with sulphur, and bandaged with new flannel, over which sheets of wadding are wrapped. The dressing should not be taken off for several days, as its earlier removal would interfere with the absorption of the sulphur, on which its curative effect depends. (Lancet, Am. ed., June, 1857, p. 507.) The dose of sulphur is from 1 to 3 drams (3.9-11.65 Gm.), mixed with syrup or molasses, or taken in milk. It is often combined with potassium bitartrate, or with magnesia.

According to M. Hannon, of Brussels, soft sulphur, recently prepared, possesses valuable therapeutic properties, not as a laxative, but as a stimulant to the circulation, lungs, and skin, far more active than ordinary sulphur. The dose of soft sulphur is from 20 to 50 grains (1.3-3.25 Gm.), given in the form of a pill. It has also been successfully employed for filling the hollows of carious teeth. (P. J. Tr., xvii.330.)

Lac Sulphuris; Milk of Sulphur; Magisterium Sulphuris; Souffre precipite, Lait de Souffre, Fr.; Schwefelmilch, G.

"Sublimed Sulphur, 100 grammes (or 3 ounces av., 231 grains); Lime, 50 grammes (or 1 ounce av., 334 grains); Hydrochloric Acid, Water, each, a sufficient quantity. Slake the Lime, and mix it uniformly with 500 cubic centimeters (or 16 fluid ounces, 435 minims) of Water. Add the Sublimed Sulphur, previously sifted, and, after thorough mixing, add 1,000 cubic centimeters (or 33 fluid ounces, 390 minims) of Water, and boil the mixture during one hour, stirring constantly, and replacing the Water lost by evaporation. Then cover the vessel, and permit the contents to cool and become clear by subsidence. Carefully draw off the clear solution, and filter the remainder. To the united liquids add gradually, and with constant stirring, Hydrochloric Acid, previously diluted with an equal volume of Water, until the liquid is nearly neutralized, still retaining, however, an alkaline reaction and a yellow color. Collect the precipitate on a strainer, and wash it, until the washings are tasteless and cease to give an acid reaction with litmus paper. Then dry the product rapidly, at a moderate heat, and keep it in well stopped bottles." U. S.

"Take of Sublimed Sulphur, 5 ounces (avoirdupois); Slaked Lime, 3 ounces (av.); Hydrochloric Acid, 8 fluid ounces, or a sufficiency; Distilled Water, a sufficiency. Heat the Sulphur and Lime, previously well mixed, in a pint (Imperial measure) of the Water, stirring diligently with a wooden spatula; boil for fifteen minutes, and filter. Boil the residue again in $\frac{1}{2}$ pint (Imp. meas.) of the Water, and filter. Let the united filtrates cool, dilute with 2 pints (Imp. meas.) of the Water, and, in an open place or under a chimney, add in successive quantities the Hydrochloric Acid previously diluted with 1 pint (Imp. meas.) of the Water, until effervescence ceases and the mixture acquires a slight acid reaction. Allow the precipitate to settle, decant the supernatant liquid, pour on fresh distilled Water, and continue the purification by affusion of Distilled Water and subsidence, until the fluid ceases to have an acid reaction and to precipitate with oxalate of ammonium. Collect the precipitated sulphur on a calico filter, wash it once with Distilled Water, and dry it at a temperature not exceeding 120 degrees F. (48.9 degrees C.)." Br.

The process for precipitated sulphur has not been much changed in the last revision; the quantity of lime has however, been diminished, which is an improvement, as the excess of lime caused loss in filtration unless great care was taken to wash the precipitate well.

In the U. S. process three molecules of calcium oxide react with six atoms of sulphur to form two mols. of calcium disulphide and one of calcium thiosulphate (hyposulphite): $3\text{CaO} + (\text{S}_2)_3 = 2\text{CaS}_2 + \text{CaS}_2\text{O}_3$. On the addition of the hydrochloric acid, six atoms of sulphur are precipitated (four from the two mols. of calcium disulphide and two from the one mol. of calcium hyposulphite), and the calcium and oxygen unite with the hydrochloric acid, so as to form calcium chloride and water, according to the reaction $2\text{CaS}_2 + \text{CaS}_2\text{O}_3 + 6\text{HCl} = 3\text{CaCl}_2 + 3\text{H}_2\text{O} + (\text{S}_2)_3$. This rationale is not exactly applicable to the British process, in which the proportion of the sulphur to the lime employed is greater than in that of the U. S. Pharmacopoeia, and on account of this greater excess of sulphur the reaction takes place as follows: $3\text{CaCl}_2 + 3\text{H}_2\text{O} + (\text{S}_2)_3$, a calcium pentasulphide being formed. Hydrochloric acid is the most eligible precipitant for the sulphur, as it gives rise to calcium chloride, which is a very soluble salt and is easily washed away. Sulphuric acid is wholly inadmissible, as it generates calcium sulphate, which, from its sparing solubility, becomes necessarily intermingled with the precipitated sulphur. According to Schweitzer, the best material from which to precipitate the sulphur is potassium sulphide, formed by boiling sulphur with caustic potassa. Dr. Otto, of Brunswick, finds that potassium sulphide is apt to contain copper sulphide, and therefore he prefers calcium sulphide.

Properties.—Precipitated sulphur is in friable lumps, of a white color, with a pale yellowish green tint, and consisting of finely divided particles slightly cohering, or, as officially described, "is a fine, amorphous powder, of a pale yellow color, without odor or taste. Insoluble in water; very slightly soluble in absolute alcohol; readily soluble in carbon disulphide; also in benzine, benzol, oil of turpentine, and many other oils; also in ether, in chloroform, and in boiling, aqueous solutions of alkaline hydrates. At 115 degrees C. (239 degrees F.) Precipitated Sulphur melts, and at a higher temperature it volatilizes, or, if air be admitted, burns to sulphur dioxide, leaving no residue. If 0.5 Gm. of Precipitated Sulphur be boiled with 10 C.c. of sodium hydrate test solution, it should be completely dissolved, leaving no residue (absence of earthy or metallic impurities). If 1 Gm. of Precipitated Sulphur be digested for several hours with 10 C.c. of ammonia water, a portion of the clear filtrate should not leave any residue on evaporation; nor should another portion be colored yellow, or rendered turbid, by acidulation with hydrochloric acid, even after the addition of an equal volume of hydrogen sulphide test solution (absence of arsenic). If 5 C.c. of water be agitated with 2 Gm. of Precipitated Sulphur, the liquid should not change the color of blue or red litmus paper (absence of acid or alkali); nor should it leave any residue on evaporation (absence of soluble impurities). If 0.5 Gm. of Precipitated Sulphur be boiled with a solution of 0.5 Gm. of potassium cyanide in 5 C.c. of water, and, after filtration, the clear liquid be acidulated with hydrochloric acid, it should not assume a reddish color, even after standing for an hour (absence of

selenium).” U. S. It is entirely dissipated by heat. Water boiled with it should not redden litmus. When recently prepared, it is devoid of taste, but possesses a peculiar smell. When long exposed, in a moist state, to the air, it becomes strongly contaminated with sulphuric acid. From its color it was formerly *lac sulphuris*, or milk of sulphur. It is insoluble in water, but dissolves in a boiling solution of caustic potassa, and in oil of turpentine by the aid of heat. When of a brilliant white color, the presence of calcium sulphate may be suspected; in which case the preparation will not be wholly volatilized by heat. If pure, it communicates a harsh feel when rubbed between the fingers, owing to the friction of the particles. (Dr. Bridges.) We have seen a sample of so called precipitated sulphur which consisted almost entirely of calcium sulphate. Precipitated sulphur differs from sublimed sulphur in being in a state of more minute division, and in presenting, after fusion, a softer and less brittle mass. Its peculiarities are supposed to depend upon the presence of water, which, however, is found in too small a quantity to constitute a regular hydrate. According to Rose, its white color is occasioned by the presence of a small proportion of hydrogen sulphide. Soubeiran states that it always contains some hydrogen sulphide, which causes it to differ as a therapeutic agent from sublimed sulphur.

PODOPHYLLUM, U. S. (BR.) PODOPHYLLUM. (MAY-APPLE.)

Medical Properties and Uses.—Podophyllum is a slow but active and certain cathartic, producing copious liquid discharges, often with much griping. It is generally thought by the profession to be an efficient cholagogue, and the experiments of Prof. Rutherford upon dogs certainly confirm this belief. It is very much employed in various parts of the country in bilious fevers and hepatic congestions, and as a general cathartic. In minute doses, frequently repeated, podophyllum has been thought to diminish the frequency of the pulse and to relieve cough, and for these effects has been given in hemoptysis and catarrh, but this employment of it is of doubtful advantage. In overdoses podophyllum acts as an irritant poison; an amount estimated at 5 grains of the resin caused death in a woman sixty years old (N. Y. Med. Rec., April, 1890); the symptoms were vomiting and purging, followed some hours after their cessation by coma, full soft pulse, slight elevation of temperature, and hemoglobinuria.

“The rhizome and roots of *Podophyllum peltatum*, Linne (nat. ord. Berberideae).” U. S. “The dried rhizome and rootlets of *Podophyllum peltatum*, Linn.” Br.

Podophylli Rhizoma, Br.; Podophyllum Root, Mandrake Root; Rhizome de Podophyllum, Fr.; Fussblattwurz, G.

Gen: Ch. Calyx three leaved. Corolla nine-petaled. Berry one-celled, crowned with the stigma. Willd.

Podophyllum peltatum. Willd. Sp. Plant. ii. 1141; Barton, Med. Bot. ii. 9; Carson, Illust. of Med. Bot., i. 18, pl. 11; B. & T. 17. The may-apple, sometimes also called mandrake, is an indigenous herbaceous plant, and the only species of the genus. The root (rhizome) is perennial, creeping, usually several feet in length about $\frac{1}{4}$ inch thick, brown externally smooth, jointed, and furnished with radicles at the joints. The stem is about a foot high, erect, round, smooth, divided at top into two petioles, and supporting at the fork a solitary one-flowered peduncle. Each petiole bears a large, peltate, palmate leaf, with six or seven wedge shaped lobes, irregularly incised at the extremity, yellowish green on their upper surface, paler and slightly pubescent beneath. The flower is nodding. The calyx is composed of three oval, obtuse, concave, deciduous leaves. The corolla has from six to nine white, fragrant petals, which are obovate, obtuse, concave, with delicate transparent veins. The stamens are from thirteen to twenty, shorter than the petals, with oblong, yellow anthers, of twice the length of the filaments. The stigma is sessile, and rendered irregular on its surface by numerous folds or convolutions. The fruit is a large oval berry, crowned with the persistent stigma, and containing a sweetish fleshy pulp, in which about three ovate seeds are embedded. It is, when ripe, of a lemon yellow color, diversified by round brownish spots.

The plant has been found on Mount Togakushi, in Japan, and is extensively diffused through the United States, growing luxuriantly in moist shady woods and in low marshy grounds. It is propagated by its creeping root, and is often found in large patches. The flowers appear about the end of May and the beginning of June; and the fruit ripens in the latter part of September. The leaves are said to be poisonous. The fruit has a subacid, sweetish, peculiar taste, agreeable to some palates, and may be eaten freely with impunity. From its color and shape, it is sometimes called wild lemon. The root is the official portion, and is said to be most efficient when collected after the falling of the leaves. It shrinks considerably in drying.

The rhizome of the Himalayan species, *Podophyllum emodi*, is an active cathartic, which has been found by Dymock and Hooper to yield 12 per cent of resin. As this resin contains over 56 per cent of podophyllotoxin, the Indian plant should be much more active than the American, which ordinarily yields only about 5 per cent of resin, containing 40 to 45 per cent of podophyllotoxin.

Properties.—The dried root is much wrinkled lengthwise, is yellowish or reddish brown externally, and furnished with fibers of a similar but somewhat paler color. It was determined, by an experiment of Mr. William Saunders, that these fibers contain as much active matter as the rhizome itself. The fracture is short and irregular, and the internal color whitish. The microscopic examination of the section shows the rhizome to be composed of loose parenchymatous tissue, with sixteen or more yellowish vascular bundles arranged in a circle, and a cortical layer of a double row of thick walled yellowish cells surmounted by the epidermis. It is officially described as “of horizontal growth, consisting of joints about 5 gm. long, flattish cylindrical, about 5 mm. thick, but somewhat enlarged at the end, which has a

circular scar on the upper side, a tuft of about ten, nearly simple, fragile roots on the lower side, and is sometimes branched laterally; smooth or somewhat wrinkled, orange brown, internally white and mealy, with a circle of small wood bundles; pith large; nearly inodorous; taste sweetish, somewhat bitter and acrid." U. S. The powder is light yellowish, gray, resembling that of a jalap. The root in its aggregate state is nearly inodorous, but in powder has a sweetish not unpleasant smell. The taste is at first sweetish, afterward bitter, nauseous, and slightly acrid. Both the decoction and the tincture are bitter; but alcohol is said to be the best solvent of the active matter. Analyzed by Mr. John R. Lewis, podophyllum yielded albumen, gum, starch, extractive, lignin, gallic acid, fixed oil, traces of volatile oil, salts of potassa and lime, and two resinous principles, one soluble in alcohol and ether, and the other soluble in alcohol only. Both resins were found to possess the actual properties of the root. Six grains operated as a drastic cathartic, with some emetic effect. (A. J. P., xix. 165.) The resin is a light brownish yellow powder, of greenish tint, devoid of crystalline appearance, becoming darker if heated above 32 degrees C., and having an acrid, bitter taste. Dr. V. Podwyssotzki, 1882 (Pharm. Zeitschrift fur Russland, vol. xx., p. 777), made a careful examination of the root and resin, and announced the active principle to be solely a neutral crystalline principle, picropodophyllin. This principle is associated with an inactive resin acid, picropodophyllic acid, and the combination of the two names podophyllotoxin. Picropodophyllin is in colorless, silky, extremely delicate needles, very soluble in chloroform, readily soluble in 95 per cent alcohol, but very slightly in 75 per cent alcohol. It is soluble in ether, and crystallizes from a warm saturated solution on cooling. It is insoluble in water, turpentine, or benzine. Podophyllotoxin is a bitter, white, resinous powder, soluble in weak alcohol and hot water. It may be precipitated from its alcoholic solution by water in large quantities. (P. J. Tr., 1882, p. 1011.) He also obtained podophylloquercetin, the coloring principle, which is closely allied to quercetin and is the cause of the varying color of resin of podophyllum. Podwyssotzki's results have since been corrected and supplemented by R. Kursten (A. J. P., 1891, p. 485), who has obtained the several principles in a purer state. His results are summarized in the footnote. Dr. Manlius Smith recommends that the resin should be prepared by forming an alcoholic tincture of the root, evaporating the tincture till most of the alcohol is driven off, and throwing the residue into water, by which the resin is precipitated. The concentration should not be carried too far, as otherwise the resin separates in clots, which cannot be easily washed. According to Dr. Smith, the resin, when pure, is white, and purges actively. It is called podophyllin. (A. J. P., xxiv. 306.) For a more complete account of what is known of the resins of podophyllum the reader is referred to the article on Resina Podophylli.

The leaves of *Podophyllum peltatum* were chemically examined by Mr. Thomas J. Husband, Jr., who obtained from them a resinous matter and a portion of the alkaloid berberine, which is found in the root. This resinous matter consisted of two distinct resins, one soluble in ether and alcohol, the other in alcohol, and both in caustic alkalies and chloroform. Mr. Husband states that the resin obtained from the leaves is similar in its chemical relations to podophyllin, but proved when taken internally to be without its purgative properties, 8 grains being taken without other effect than slight headache. (A. J. P., 1869, p. 200.)

B. F. Carter (A. J. P., 1886, p. 449) has since examined the leaves. He finds tannin, uncrystallizable sugar coloring matter, and 6 per cent of resin. This latter seems to be of twofold character, ether dissolving the soft resin, while the hard resin remains behind. The resin has a bitter taste and a much milder action than that of the rhizome. Fused with caustic potash a small amount of protocathechuic acid seems to be formed.

SODII CHLORIDUM, U. S. (BR.) SODIUM CHLORIDE.

NaCl; 58.37.

NaCl; 58.4.

Medical Properties.—Sodium chloride, in small doses, acts as a stomachic tonic and anthelmintic, in larger doses as a purgative and emetic. From the experiments of Prof. Buchheim, it appears that common salt quickly passes into the blood, and is thrown off in greater part, in six hours, by the kidneys. The portion not found in the urine and feces is probably appropriated to the uses of the economy. M. Plouviez, as the result of experiments made upon himself, came to the conclusion that the use of a saline regimen has the effect of increasing the number of the red blood corpuscles as well as the weight and strength of the body. This is, however, contradicted by the more recent experiments of Dr. Munch, and the common experience of mankind seems to show that, while the habitual use of a certain amount of the salt is necessary for health, overuse of it has no effect in producing plethora.

Common salt has been used with good effect by a number of practitioners as a remedy for intermittent fever. It is not alleged to be equal to quinine. The dose is from 8 to 12 drams (31.1-46.6 Gm.), given in divided doses during the apyrexia. It is best administered in mucilage of slippery elm, or in coffee. In hemoptysis, common salt, in the dose of 1 teaspoonful (3.9 Gm.), taken dry, often proves successful in stopping the flow of blood. Externally applied in solution it is stimulant, and may be used either locally or generally. Locally it is sometimes employed as a fomentation in sprains and bruises; and as a general external application it forms the salt water bath, a valuable remedy as a tonic and excitant in depraved conditions of the system, especially when occurring in children. A pound of salt dissolved in 4 gallons of water forms a solution of about the strength of sea water, and suitable for a bath. Dose, as a cathartic, from 2 drams to ½ ounce (7.8-15.5 Gm.); as an emetic, from ½ ounce

to 1 ounce (15.5-31.1 Gm.), dissolved in four or five times its weight of water. It is frequently used as a clyster, 2 tablespoonfuls in 1 pint of water.

The uses of common salt in domestic economy as a condiment and an antiseptic are well known. In pharmacy it is employed to prepare chlorine, hydrochloric acid, ammonium chloride, calomel, and corrosive sublimate. It is also used to form sodium sulphate with a view to its conversion into sodium carbonate.

Natrium Chloratum Purum, P. G.; Chloruretum Sodicum, Sal Commune, s. Culinare; Table Salt; Sodium Chloride, Muriate of Soda, Sea Salt, Common Salt; Chlorure de Sodium, Hydrochlorate de Soude, Sel commun, Sel de Cuisine, Sel Marin, Fr.; Chlornatrium, Kochsalz, G.; Salt, Dan., Sw.; Chloruro di Sodio, Sal commune, It.; Sal, Sp.

This mineral production, so necessary to mankind, is universally distributed over the globe, and is the most abundant of the native soluble salts. Most animals have an instinctive relish for it; and, from its frequent presence in the solids and fluids of the animal economy, it may be supposed to perform an important part in assimilation and nutrition.

Natural State.—Common salt exists in nature either in the solid state or in solution. In the solid state, called rock salt, fossil salt, and sal gemmae, it is often found forming extensive beds, and even entire mountains, from which it is extracted in blocks or masses by mining operations. Its geological position is very constant, it occurring almost invariably in secondary formations, associated with clay and gypsum. In solution it exists in certain springs and lakes, and in the waters of the ocean. The principal salt mines are found in Poland, Hungary and Russia; in various parts of Germany and Austria, particularly the Tyrol; in Cheshire, England; in Spain; in various parts of Asia and Africa; in the island of St. Domingo; and in Peru and other countries of South America. With the exception of a remarkable bed of rock salt in the island of Petite Anse, in Vermilion Bay, on the coast of Louisiana, there are in the United States no salt mines east of the Rocky Mountains; but there are numerous salt springs, which either flow naturally or are produced artificially by sinking wells to various depths in places where salt is known to exist. These are found principally in Missouri, Kentucky, Illinois, Ohio, Michigan, Pennsylvania, Virginia, West Virginia, and New York. In the last mentioned state the springs are the most productive, the chief ones being situated at Salina, Montezuma, and Galen. In West Virginia an important salt region exists, extending fifteen miles on both sides of the Great Kenawha River, and in Michigan in the counties of Huron, Bay and Saginaw, extensive salt wells are worked. The production of salt in 1890 was as follows: Michigan, 3,837,632 barrels (barrels of 280 pounds); New York, 2,532,036 barrels; other states, 2,407,323 barrels; total, 8,776,991 barrels; 1891, Michigan, 3,927,671 barrels; New York, 3,532,600 barrels; other states, 2,773,430 barrels; total, 10,233,701 barrels; 1892, Michigan, 3,812,054 barrels; New York, 4,400,000 barrels; other states, 3,373,700 barrels; total, 11,585,754 barrels. Rock salt is always transparent or translucent; but it often exhibits various colors, such as red, yellow, brown, violet, blue, etc., which are supposed to be derived from iron and manganese.

Extraction.—Mines of salt are worked in two ways. When the salt is pure, it is merely dug out in blocks and thrown into commerce. When impure, it is dissolved in water, and extracted afterward from the solution by evaporation. When salt is naturally in solution, the mode of extraction depends upon the strength of the brine and the temperature of the place where it is found. When the water contains from 14 to 15 per cent of the salt, it is extracted by evaporation in large iron boilers. If, however, it contains only 2, 3, 4, or 5 per cent, the salt is obtained in a different manner. If the climate be warm, it may be procured by spontaneous evaporation, effected by the heat of the sun; if temperate, by a peculiar mode of evaporation, to be mentioned presently, and the subsequent application of artificial heat.

Sea water is a weak saline solution, containing 2.7 per cent of common salt, which is extracted by the agency of solar heat in warm countries. Salt thus obtained is called bay salt. The extraction is conducted in Europe principally on the shores of the Mediterranean, the waters of which are saltier than those of the open ocean. The mode in which it is performed is by letting the sea water into shallow dikes, lined with clay, and capable, after having been filled, of being shut off from the sea. In this situation the heat of the sun gradually concentrates the water, and the salt is deposited. About 30,000 tons a year are thus made at Alameda, California, the only place in the United States where solar evaporation is carried out. In temperate climates, weak brines are first concentrated in buildings called graduation houses. These are rough wooden structures, open on the sides, ten or eleven yards high, five or six wide, and three or four hundred long, and containing an oblong pile of brushwood somewhat smaller than the building itself. The brine is pumped up into troughs full of holes, placed above the brushwood, upon which it is allowed to fall, and in its descent it becomes minutely divided. This operation, by greatly increasing the surface of the brine, promotes its evaporation; and, being repeated several times, the solution is at last brought to the requisite degree of strength to permit of its final concentration in iron boilers by artificial heat.

Properties.—Sodium chloride is white, without odor, and of a peculiar taste called saline. It usually crystallizes in cubes; but by hasty evaporation it often assumes the form of hollow quadrangular pyramids, or hopper shaped crystals, consisting of an aggregation of cubes. It is officially described as in "colorless, transparent, cubical crystals, or a white, crystalline powder, odorless, and having a purely saline taste. Permanent in dry air. Soluble in 2.8 parts of water, at 15 degrees C. (59 degrees F.), and in 2.5 parts of boiling water; almost insoluble in alcohol; insoluble in ether or chloroform. When heated, the salt decrepitates. At a red heat it fuses, and at a white heat it is slowly volatilized and partly decomposed. To a nonluminous flame it imparts an intense, yellow color. The aqueous solution of the salt is neutral to litmus paper. With silver nitrate test solution, the solution yields a white, curdy precipitate, insoluble in nitric acid. No turbidity could be produced in 5 C.c. of the aqueous solution (1 in 20) by the addition of 0.5 C.c. of sodium cobaltic nitrate test solution (limit of potassium). The aqueous solution, slightly acidulated with acetic acid, should not be rendered turbid by ammonium oxalate test solution (absence of calcium); nor by barium chloride test solution, either before or after addition of ammonia water in slight excess (absence of arsenic, lead, zinc, iron, aluminum, etc.). No turbidity should be produced in the aqueous solution by the addition of sodium phosphate test solution and a few drops of ammonia water (absence of magnesium, etc.). If 2 Gm. of the finely powdered salt be removed by filtration, then the filtrate evaporated to dryness and the residue dissolved in 1 C.c. of water and mixed with a few drops of starch test solution, the addition of chlorine water, drop by drop, should produce neither a blue nor a yellow tint (absence of iodide or bromide). If 0.195 Gm. of well dried Sodium Chloride be dissolved in 10 C.c. of water, and the solution mixed with a few drops of potassium chromate test solution, it should require not less than 33.4 C.c. of silver nitrate decinormal volumetric solution to produce a permanent red color (corresponding to at least 99.9 per cent of the pure salt.)" U. S. When pure, it undergoes no change in the air; but when contaminated with magnesium chloride, as not unfrequently happens, it is deliquescent. Exposed to a gradually increasing heat, it first

decrepitate from the presence of interstitial moisture, next melts, and finally volatilizes in white fumes with but partial decomposition. (Mulder, Journ. de Pharm. et de Chim. 4e ed., iii.) It is decomposed by several of the acids, particularly sulphuric and nitric, which disengage vapors of hydrochloric acid; by potassium carbonate with the assistance of heat; and by silver nitrate and mercurous nitrate. In contact with iron, in the presence of air and moisture, it undergoes decomposition. (Chem. News, June, 1869.) It is decomposed by steam excessively heated, with the escape of hydrochloric acid and an alkaline residue. (Chem. News, June 4, 1875.) Several varieties of common salt are distinguished in commerce, as stoved salt, fishery salt, bay salt, etc.; but they are characterized by the size and compactness of the grains and not by any difference in composition.

Composition.—Common salt, in its pure state, consists of one atom of chlorine and one of sodium. It contains no water of crystallization. The common salt of commerce, besides pure sodium chloride, contains, generally speaking, insoluble matter, and, usually more or less of calcium and magnesium sulphates and calcium and magnesium chlorides. When pure, it is not precipitated by sodium carbonate, barium chloride, or potassium ferrocyanide. Calcium chloride is generally present in very small amount; but the magnesium chloride sometimes amounts to 28 parts in 1,000. Calcium sulphate is usually present, constituting variously from 1 to 22½ parts in 1,000; and magnesium sulphate is sometimes present and sometimes absent. To separate the earths, a boiling solution of sodium carbonate must be added as long as any precipitate is formed. The earths will form as carbonates, and must be separated by filtration, and the sodium sulphate and sodium chloride resulting from the double decomposition will remain in solution. The sodium sulphate may then be decomposed by the cautious addition of barium chloride, which will generate sodium chloride and insoluble barium sulphate.

CARBO LIGNI, U. S. (BR.) CHARCOAL.

Medical Properties, Etc.—Powdered Charcoal is Disinfectant and Absorbent. It is employed with advantage in diarrhea as an absorbent, and in dyspepsia with fetid breath and eructations. It is also useful in the form of injections, in putrid discharges from the uterus. M. Belloc recommends it strongly in gastralgia, and especially pyrosis, in which, if it fails to remove the disease, it abates the pain, nausea, and vomiting; and his observations have been confirmed by a committee of the French Academy of Medicine. As a remedy in obstinate constipation, Dr. Daniels of Savannah, speaks of it in high terms. He also found it useful in nausea and constipation of pregnancy. On the other hand some practitioners have found charcoal to confine the bowels. Dr. Wilson, of New Zealand, speaks highly of it in the diarrhea of measles, and in epidemic cholera. Dr. Newman recommends it as a dressing to wounds and ulcers. Mr. Wormald, of St. Bartholomew's Hospital, has made a useful application of the disinfecting power of dry charcoal, in what he calls the charcoal quilt. This consists of two sheets of cotton wadding, quilted together in small segments, with a tolerably thick layer of powdered charcoal between them. The quilts thus prepared may be of any size, so as to fit a gangrenous sore or stump. Its use as an ingredient of poultices is noticed under Cataplasma Carbonis. Several of its varieties are used as tooth powder. Those generally preferred are the charcoals of the cocconut shell and of bread. It is said that charcoal proves useful in preserving the teeth by absorbing the acid sometimes morbidly present in the mucus of the mouth. The dose of charcoal varies from 1 to 4 teaspoonfuls (3.9-15.5 Gm.) or more. Dr. Daniel gave it in his case of constipation in doses of 1 tablespoonful (15.5 Gm.), repeated every half hour. Charcoal biscuits have been prepared, containing 15 or 20 per cent of charcoal in fine powder, while charcoal lozenges, either with charcoal alone or associated with bismuth, have been employed with asserted good results in certain forms of gastric disturbances.

"Charcoal prepared from soft wood, and very finely powdered. It should be kept in well closed vessels." U. S. "Wood charred by exposure to red heat without access of air." Br.

Wood Charcoal, Vegetable Charcoal; Carbo Pulveratus, P. G.; Carbo Praeparatus, Carbo e Ligno; Charbon vegetal, Charbon de Bois, Fr.; Holzkohle, Preparirte Kohle, G.; Carbone di Legno, It.; Carbon de Lena, Sp.

Preparation on the Large Scale.—Billets of wood are piled in a conical form, and covered with earth and sod to prevent the free access of air; several holes being left at the bottom and one at the top of the pile, in order to produce a draft to commence the combustion. The wood is then kindled from the bottom. In a little while the hole at the top is closed, and after the ignition is found to have pervaded the whole pile, those at the bottom are stopped also. The combustion taking place with a smothered flame, the volatile portions of the wood, consisting of hydrogen and oxygen are dissipated, while the carbon is left; a portion of it, however, being lost by combustion. Wood thus carbonized, yields not more than 17 or 18 per cent of charcoal. A better method is to char the wood in iron cylinders, when it yields from 22 to 23 parts in 100 of excellent charcoal; and, at the same time, the means are afforded for collecting the volatile products, consisting of pyroligneous acid, empyreumatic oil, and tar. This process for obtaining charcoal has been described under another head. (See Acidum Aceticum.) A method of preparing charcoal by subjecting wood to overheated steam has been invented by M. Violette. When the temperature of steam is 300 degrees C. (572 degrees F.), the wood is converted into a peculiar charcoal, called red charcoal, which is intermediate in its qualities between wood and ordinary charcoal. When the temperature is lower, the carbonization is incomplete; when higher, the product is black charcoal. The steam process yields a uniform charcoal for a given temperature, which may be easily regulated, and a product about double that obtained in closed cylinders. Charcoal contains carbon, in proportion to the temperature at which it is formed; varying from 65 per cent when made at 250 degrees C. (480 degrees F.) to 80 per cent when made at 400 degrees C. (752 degrees F.). The gaseous matter present is always inversely as the temperature of carbonization. Thus, for charcoal made at 300 degrees C. (572 degrees F.), it is one-third of its weight; at 350 degrees C. (662 degrees F.), one-fourth. (Journ. de Pharm., 1851, p. 35.)

Mr. E. C. C. Stanford has called attention to a variety of vegetable charcoal, obtained by charring a species of sea weed, *Laminaria digitata*, gathered on the shores of the Hebrides, which, although, on account of the large proportion of calcium carbonate contained in it (20 per cent), unfit for use in refining sugar, possesses more of the deodorizing, and decolorizing power than animal charcoal itself, which, with the exception referred to, it closely resembles in chemical composition. (P. J. Tr., 1867, p. 186.)

Preparation for Medical Use.—M. Belloe recommends charcoal for this purpose to be obtained from poplar shoots, cut at the time the sap rises, and deprived of their bark. The carbonization should be performed in cast iron vessels at a red white heat. The product is a light and brilliant charcoal, which must be purified by being macerated for three or four days in water, frequently renewed. It is then dried, powdered, and placed in bottles, which should be well stopped. The charcoal most esteemed in Philadelphia for medicinal purposes is that prepared by the Messrs. Dupont, near Wilmington, Delaware, for the manufacture of gunpowder. It is made from young willow shoots of two or three years' growth.

Properties.—Charcoal is a black, shining, brittle, porous substance, tasteless and inodorous, and insoluble in water. It is a good conductor of electricity, but a bad one of heat. It possesses the remarkable property of absorbing many times its own bulk of certain gases. "If 1 Gm. of Charcoal be boiled with a mixture of 3 C.c. of potassium hydrate test solution and 5 C.c. of water for several minutes, the filtrate should be colorless or nearly so (evidence of complete carbonization)." U. S. When exposed to the air after ignition, it increases rapidly in weight, absorbing from 12 to 14 per cent of moisture. As ordinarily prepared, it contains the incombustible part of the wood, amounting to 1 or 2 per cent, which is left as ashes when the charcoal is burned. These may be removed by digesting the charcoal in diluted hydrochloric acid, and afterward washing it thoroughly with boiling water.

For internal use charcoal is preferred by some in the granular form. Mr. W. Lascelles Scott employs the following method of preparing it: He prefers the wood of the box, willow, or linden, which, after being charred, should be allowed to cool out of contact with air, then boiled for some time in diluted hydrochloric acid, and afterward, having been thoroughly washed with pure water, in a little weak ammonia. The fragments are again ignited, and then quickly powdered, and passed through a sieve of 80 or 100 apertures to the inch. Nine pounds of this powder are mixed with 1 pound of pure sugar passed through a 30 sieve, and 4 ounces of gum arabic in impalpable powder. The whole is then moistened with a few ounces of warm distilled water, to which have been added an ounce and a quarter of tincture of benzoin, and a little mucilage. The mass is now granulated on flat steam pans, in the usual manner, at a temperature of 101.6 degrees to 107.2 degrees C. (215 degrees to 225 degrees F.). When perfectly dry it is sifted, and secured in well stopped bottles. (Chem. News, 1867, p. 204.)

Dr. Stenhouse has devised a process for combining alumina with common vegetable charcoal, forming what he calls aluminized charcoal, which is an economical substitute for purified animal charcoal, and equally efficacious as a decolorizer. It is prepared by digesting finely powdered charcoal with sufficient of the solution of aluminum sulphate to give an impregnation of 7.5 per cent of alumina. The whole is evaporated to dryness, and ignited in a covered Hessian crucible, until the water and acid have been dissipated. Aluminized charcoal is perfectly black, though thoroughly impregnated with anhydrous alumina, and only requires to be carefully pulverized to be ready for use. (P. J. Tr., 1857, p. 364.) On similar principles, Dr. Stenhouse prepares his artificial bone black, by impregnating powdered wood charcoal with 7.5 per cent of calcium phosphate, by digesting it in a solution of this salt in hydrochloric acid evaporating to dryness, and igniting in covered vessels. This charcoal decolorizes well but can be used only for neutral solutions.

Charcoal may act either as an oxidizer or as a deoxidizer; and these contrary powers seem to depend upon its having for oxygen a medium affinity, which enables it to take that element from some bodies, and to yield it to others, or at least by its porosity to facilitate atmospheric oxidation. Thus, it is known to reduce several oxides; while, on the other hand, it aids powerfully in the oxidation of animal matter. The bodies of two dogs having been laid in an open box on a bed of charcoal, a few inches deep, and covered by the same material, were kept by Mr. John Turnbull of Glasgow for six months in his laboratory, without emitting any perceptible effluvia; and when they were examined at the end of this time, scarcely anything remained but the bones. Dr. Stenhouse, who relates this experiment, has confirmed it by observations of his own, and believes that the animal matter thus treated undergoes putrefaction, though the products, by their rapid oxidation and absorption, are prevented from contaminating the air. He, therefore, considers charcoal not to be antiseptic, but the very opposite. (Chem. Gaz., 1854.) It is said that water may be kept sweet at sea by the addition of a little powdered charcoal to each cask.

CAPSICUM, U. S. (BR.) CAPSICUM. (CAYENNE PEPPER. AFRICAN PEPPER.)

Medical Properties and Uses.—Cayenne pepper is a powerful local stimulant, producing when swallowed a sense of heat in the stomach and a general glow over the body without any narcotic effect. It is much employed as a condiment, and proves highly useful in correcting the flatulent tendency of certain vegetables and aiding their digestion. Hence the advantage derived from it by the natives of tropical climates who live chiefly on vegetable food. In the East Indies it has been used from time immemorial. From a passage in the works of Pliny, it appears to have been known to the Romans. **As a medicine it is useful in cases of enfeebled and languid stomach, and is occasionally prescribed in dyspepsia and atonic gout, particularly when attended with much flatulence, or occurring in persons of intemperate habits.** It has also been given as a stimulant in palsy and certain lethargic affections. To quinine sulphate it forms an excellent addition in some cases of intermittents in which there is a great want of gastric susceptibility. Upon the same principle of arousing the susceptibility of the stomach, it may prove useful in low forms of fever, as an adjuvant to tonic or stimulant medicines. Its most important application, however, is to the treatment of malignant sore throat and scarlet fever, in which it is used both internally and as a gargle. The following formula was employed in malignant scarlatina, with great advantage in the West Indies, where this application of the remedy originated. Two tablespoonfuls (31.1 Gm.)

of the powdered pepper, with 1 teaspoonful (3.9 Gm.) of common salt, are infused for an hour in a pint of boiling liquid composed of equal parts of water and vinegar. This is strained when cool through a fine linen cloth and given in the dose of 1 tablespoonful (15 C.c.) every half hour. The same preparation is also used as a gargle. It is, however, only to the worst cases that the remedy is applied so energetically. In milder cases of scarlatina, with inflamed or ulcerated throat, much relief and positive advantage often follow the employment of the pepper in a more diluted state. Capsicum has been advantageously used in sea sickness, in the dose of 1 teaspoonful (3.9 Gm.) given in some convenient vehicle on the first occurrence of nausea. It is thought also to have been beneficial in hemorrhoidal affections. It has long been used as a stomachic stimulant in the enfeebled digestion of drunkards, and in delirium tremens.

Applied externally, Cayenne pepper is a powerful rubefacient, which has the advantage of acting speedily without endangering vesication. It may be applied in the form of cataplasm, or more conveniently and efficiently as a lotion, mixed with heated spirit. The powder or tincture brought into contact with a relaxed uvula often acts very beneficially. The tincture has also been used advantageously in chilblain. The fluid extract and the ethereal extract (Oleoresina Capsici, U. S.) are powerfully rubefacient.

The dose of the powder is from 5 to 10 grains (0.33-0.65 Gm.), which is most conveniently given in the form of a pill. Of an infusion prepared by adding 2 drams to $\frac{1}{2}$ pint of boiling water, the dose is $\frac{1}{2}$ fluid ounce (15 C.c.). A gargle may be prepared by infusing $\frac{1}{2}$ dram of the powder in 1 pint of boiling water, or by adding $\frac{1}{2}$ fluid ounce of the tincture to 8 fluid ounces of rose water.

"The fruit of *Capsicum fastigiatum*, Blume (nat. ord. Solanaceae)." U. S. "The dried ripe fruit of the *Capsicum fastigiatum*, Blume." Br.

Capsici Fructus, Br.; Capsicum Fruit; Cayenne Pepper; African Pepper; Fructus Capsici, P. G.; Piper Hispanicum; Pod Pepper, E.; Capsique, Piment des Jardins, Piment rouge, Poivre de Cayenne, Poivre de Guinee, Poivre d'Inde, Fr.; Spanischer Pfeffer, G.; Pepperone, It.; Pimiento, Sp.

Gen. Ch. Corolla wheel shaped. Berry without juice. Willd.

Numerous species of *Capsicum*, inhabiting the East Indies and tropical America, are enumerated by botanists, the fruit of which, differing simply in the degree of pungency, may be indiscriminately used. *C. baccatum*, or bird pepper, and *C. frutescens*, are said to yield most of the Cayenne pepper brought from the West Indies and South America; and Ainslie informs us that the latter is chiefly employed in the East Indies. Both Pharmacopœias now recognize, as the source of Capsicum, *C. fastigiatum*, a species growing in the East Indies and on the coast of Guinea. The one most extensively cultivated in Europe and this country is *C. annum*. The first three are shrubby plants, the last is annual and herbaceous.

Capsicum annum. Willd. Sp. Plant. i. 1052; B. & T. 189. The stem of the annual capsicum is thick, roundish, smooth, and branching; rises two or three feet in height, and supports ovate, pointed, smooth, entire leaves, which are placed without regular order on long footstalks. The flowers are solitary, white, and stand on long peduncles at the axils of the leaves. The calyx is persistent, tubular, and five cleft; the corolla, monopetalous and wheel shaped, with the limb divided into five spreading, pointed, and plaited segments; the filaments, short, tapering, and furnished with oblong anthers; the germen, ovate, supporting a slender style which is longer than the filaments and terminates in a blunt stigma. The fruit is a pendulous, pod like berry, of varying shape and size, light, smooth, and shining, of a bright, scarlet, orange, or sometimes yellow color, with two or three cells, containing a dry, loose pulp, and numerous flat, kidney shaped, whitish seeds.

Capsicum fastigiatum. Blume. B. & T. 188. This species resembles closely *C. annum*, but is distinguished by the lobes of the corolla being more acute, and especially by the fruit and seeds. The latter are smaller than those of *C. annum*, and the erect, narrowly ovoid, oblong pod is nearly cylindrical, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, and of a bright orange scarlet color when ripe.

These plants are natives of the warmer regions of Asia and America, and are cultivated in almost all parts of the world for both culinary and medicinal purposes. *C. annum* is chiefly grown in this country; its flowers appear in July and August, and the fruit ripens in October. The several varieties of it differ in the shape of the fruit. The most abundant is probably that with a large irregularly ovate berry, depressed at the extremity, which is much used in the green state for pickling. The variety most used in making Cayenne pepper is that with long, conical, generally pointed, recurved fruit, usually not thicker than the finger. Sometimes we meet with small, spherical, slightly compressed berries, not greatly exceeding a large cherry in size. The red or Cayenne pepper of commerce is obtained by grinding the pods of several species of *Capsicum*, and is of variable strength. A variety of capsicum, consisting of very small, conical, pointed, exceedingly pungent berries, less than an inch in length, is imported from Liberia. It is probably the *Capsicum fastigiatum*. In England the fruit of *C. annum* is frequently called chillies. The official description of the fruit of *C. fastigiatum* is as follows: "Oblong-conical, from 10 to 20 mm. long, supported by a flattish, cup shaped



Capsicum Plant and Seed.

five-toothed calyx, with a red shining, membranous and translucent pericarp, enclosing two cells, and containing flat reniform, yellowish seeds attached to a thick, central placenta. It has a peculiar odor, and an intensely hot taste." U. S.

Powdered Capsicum is usually of a more or less bright red color, which fades upon exposure to light and ultimately disappears. The color of the Liberia of African pepper, in powder, is a light brownish yellow. The odor is peculiar and somewhat aromatic, stronger in the recent than in the dried fruit. The taste is bitterish, acrid and burning, producing a fiery sensation in the mouth, which continues for a long time. The pungency appears to depend on a peculiar principle, which was obtained, though not in a perfectly isolated state, by Braconnot, and named capsaicin. It is obtained as a thick yellowish red liquid, but slightly soluble in water. When gently heated it becomes very fluid, and at a higher temperature is dissipated in fumes which are extremely irritating to the respiration. It is a mixed substance, consisting of resinous and fatty matter. In 1876, Thresh isolated a well defined active-principle, capsaicin, from the extract, which he obtained by exhausting Cayenne pepper with petroleum. From the red liquor dilute caustic alkali removes capsaicin, which is to be precipitated in minute crystals by passing carbonic acid through the alkaline solution. The crystals may be purified by recrystallizing them from either alcohol, ether, benzine, glacial acetic acid, or hot carbon disulphide; in petroleum capsaicin is but sparingly soluble, yet dissolves abundantly on addition of fatty oil. The latter being present in the pericarp is the reason capsaicin can be extracted by the above process. The crystals of capsaicin are colorless, and answer to the formula $C_{15}H_{14}O_2$; they melt at 59 degrees C. (138.2 degrees F.), and begin to volatilize at 115 degrees C. (239 degrees F.), but decomposition can be avoided only with great care. The vapors of capsaicin are of the most dreadful acridity, and even the ordinary manipulation of that substance requires much precaution. Felletar (Journ. de Pharm., April, 1870, p. 347) first obtained from capsicum fruits a volatile alkaloid, which resembles coniine in odor, but is distinguished by the different shape of its hydrochlorate crystals. H. Pabst has recently made a thorough investigation of the fruit of *C. annuum*. He does not think that an alkaloid exists originally in the fruit, but believes that the alkaloid reactions are due to a decomposition product. He finds, besides capsaicin, a red coloring matter, and oleic, palmitic, and stearic acids. The red coloring matter, by saponification, was shown to be a cholesterin ester of the fatty acids. (A. J. P., 1892, p. 370.) Red lead oxide is sometimes added to the powdered capsicum sold in Europe. It may be detected by digesting in diluted nitric acid, and precipitating the lead by sodium sulphate. Capsicum is said to be sometimes adulterated with colored sawdust; to be recognized by the microscope. The cut represents the characteristic cells of ground capsicum. It is occasionally attacked by insects.

ZINGIBER, U. S. (BR.) GINGER.

Medical Properties and Uses.—Ginger is a grateful stimulant and carminative, and is often given in dyspepsia, flatulent colic, and the enfeebled state of the alimentary canal attendant upon atonic gout. It is an excellent addition to bitter infusions and tonic powders, imparting to them an agreeable, warming and cordial operation upon the stomach. When chewed it produces much irritation of the mouth, and a copious flow of saliva, and when snuffed up the nostrils in powder it excites violent sneezing. Externally it is rubefacient. It may be given in powder or in infusion. The dose of the former is from 10 grains to 1 scruple (0.65-1.3 Gm.) or more. The infusion may be prepared by adding ½ ounce of the powdered or bruised root to 1 pint of boiling water, and may be given in the dose of 1 or 2 fluid ounces (30-60 C.c.). A fluid extract and an oleoresin of ginger are now official, and are very convenient preparations. (See *Extractum Zingiberis Fluidum* and *Oleoresina Zingiberis*.) The dose of the former may be from 10 to 30 minims (0.6-1.9 C.c.), that of the latter from 2 to 5 minims (0.12-0.3 C.c.). There is also an unofficial tincture, the dose of which is about a fluid dram (3.7 C.c.).



Zingiber Root and Plant.

"The rhizome of *Zingiber officinale*, Roscoe (nat. ord. Scitamineae)." U. S. "The scraped and dried rhizome of *Zingiber officinale*." Br.

Rhizoma *Zingiberis*, P. G.; Gingembre, Fr.; Ingwer, G.; Zenzéro, It.; Gengibre, Sp.

Gen. Ch. Flowers spathaceous. Inner limb of the corolla with one lip. Another double, with a simple recurved horn at the end. Germen inferior. Style enclosed in the furrow formed by the anther. Loudon's Encyc. of Plants.

Zingiber officinale. Roscoe, Trans. Linn. Soc. viii. 348 Carson, Illust. of Med. Bot. ii. 55, pl. 98.—*Amomum zingiber*. Willd. Sp. Plant. i. 6; B. & T. 270. The ginger plant has a biennial or perennial creeping, tuberous root or rhizome, and an annual stem, which rises 2 or 3 feet in height, is solid, round, erect, and enclosed in an imbricated membranous sheathing. The leaves are lanceolate, acute, smooth, 5 or 6 inches long by about 1 inch in breadth, and stand alternately on the sheaths of the stem. The flower stalk rises by the side of the stem from 6 inches to 1 foot, and like it is clothed with oval, acuminate sheaths; but it is without leaves, and terminates in an oval, obtuse, bracteal, imbricated spike. The flowers are of a dingy yellow color, and appear two or three at a time between the bracteal scales.

The plant is a native of Hindustan, and is cultivated in all parts of India. It is also cultivated in the West Indies, whither it was transplanted from the East, and at Sierra Leone in Africa. The flowers have an aromatic smell,

and the stems when bruised are slightly fragrant; but the root is the portion in which the virtues of the plant reside. This is fit to be dug up when a year old. In the West Indies, the ginger crop is gathered in January and February, after the stems have withered. After having been properly cleansed, the root is scalded in boiling water, in order to prevent germination, and is then rapidly dried. Thus prepared, it constitutes the ordinary ginger of commerce, or black ginger, as it is sometimes called from the darkish color acquired in the process. It is imported chiefly from Calcutta, and is known to the druggists by the name of East India ginger; but lately considerable quantities have been brought from Africa, and some probably reaches us from the West Indies. In Jamaica another variety is prepared by selecting the best roots, depriving them of their epidermis, and drying them separately and carefully in the sun. This is called in the books white ginger, and is most highly valued. It reaches us from England, where it is said to undergo some further preparation, by which its appearance is improved. It is usually called in our markets Jamaica ginger. The root is also at present imported from the East Indies deprived of the epidermis. Considerable quantities are brought immediately from the West Indies in a recent state, and sold by the confectioners. A preserve is made from ginger by selecting the roots while young and tender, depriving them of their cortical covering, and boiling them in syrup. This is occasionally imported from the East and West Indies. This preserved ginger, when good, is translucent and tender.

The recent root is from 1 to 4 inches long, somewhat flattened on its upper and under surface, knotty, obtusely and irregularly branched, or lobed, externally of a light ash color with circular rugae, internally yellowish white and fleshy. It sometimes germinates when kept in a damp atmosphere. The common or black ginger is of the same general shape, but has a dark ash colored wrinkled epidermis, which, being removed in some places, exhibits patches of an almost black color, apparently the result of exposure. Beneath the epidermis is a brownish, resinous, almost horny cortical portion. The interior parenchyma is whitish and somewhat farinaceous. The powder is of a light yellowish brown color. This variety is most extensively used. The Jamaica or white ginger differs in being entirely deprived of epidermis, and white or yellowish white on the outside. The pieces are rounder and thinner, in consequence of the loss of substance in their preparation. They afford when pulverized, a beautiful yellowish white powder, which is brought from Liverpool in jars. This variety is firm and resinous, and has more of the sensible qualities of ginger than the black. The uncoated ginger of the East Indies resembles the Jamaica, but is darker, being gray rather than white. As the Jamaica commands a much higher price than even the uncoated East India production, the latter is occasionally altered to simulate the former. This is sometimes done by coating the exterior with calcium sulphate or carbonate, sometimes by bleaching, by which not only the exterior, but also the internal parts are rendered whiter than in the unprepared root. Trommsdorff found, in a specimen which he examined, evidences of the presence of chlorides, sulphates, and calcium, and concluded that the bleaching was effected by chlorine, or by calcium chloride and sulphuric acid. Having macerated some black ginger in water, deprived it of the cortical portion, treated it for twenty-four hours with sulphuric acid diluted with nine times its weight of water, and finally placed it in a mixture of calcium chloride and water, in which it was allowed to remain for two days, he found it, upon being washed and dried, to present an appearance closely resembling that of the finest white ginger, both on the surface and internally. (Ann. der Pharm., xvii. 98.) According to Brande, ginger is often washed in whiting and water; and Pereira states that it is sometimes bleached by exposure to the fumes of burning sulphur.

General Properties.—The U. S. Pharmacopœia describes ginger as "about 5 to 10 cm. long, 10 to 15 mm. broad, and 4 to 8 mm. thick, flattish, on one side lobed or clavately branched; deprived of the corky layer; pale buff colored, striate, breaking with a mealy, rather fibrous fracture, showing numerous small, scattered resin cells and fibro vascular bundles, the latter enclosed by a nucleus sheath; agreeably aromatic, and of a pungent and warm taste." U. S. The odor of ginger is aromatic and penetrating, the taste spicy, pungent, hot, and biting. These properties gradually diminish, and are ultimately lost, by exposure. The virtues of ginger are extracted by water and alcohol.

The peculiar flavor of the root seems to depend on the volatile oil, its pungency partly on the resinous or resino-extractive principle. A considerable quantity of pure white starch may be obtained from it. The volatile oil, examined by A. Papousck, was yellow, of the odor of ginger, and of a hot aromatic taste. Its sp. gr. was 0.893, and its boiling point 246.1 degrees C. (475 degrees F.). Deprived of water by distillation over phosphoric oxide, it consisted of carbon and hydrogen, with the formula $C_{17}H_{18}$, and, therefore, belongs to the terpenes. Thresh considers that the essential oil is mainly made up of a hydrocarbon, CH , or isomers of it, which boil at from 245 degrees to 270 degrees C. (Pharm. Journ. Trans., No. 586, 1881.) Schimmel & Co., in a recent report (Oct., 1893), state that the essential oil contains camphene and phellandrene, and hence the terpenes have the formula $C_{17}H_{18}$, as first stated. Fluckiger obtained from 112 pounds of Jamaica ginger $4\frac{1}{2}$ ounces of the oil, or about $\frac{1}{4}$ of 1 per cent. He states, however, that Messrs. Schimmel & Co., of Leipsic, informed him that they obtained as much as 2.2 per cent from good ginger. (Pharmacographia, 2d ed., p. 637.) Those pieces of ginger which are very fibrous, light and friable, or worm eaten, should be rejected. The commercial powder of ginger is very frequently adulterated; rice starch, powdered ginger which has been exhausted in making preparations, and even brick dust and chalk, being used, and the loss of pungency made good by the addition of capsicum or mustard.

SODII SULPHAS, U. S. BR., SODIUM SULPHATE. (GLAUBER'S SALT.)

$Na_2SO_4 \cdot 10H_2O$; 321.42.

$Na_2SO_4 \cdot 10H_2O$; 322

Medical Properties and Uses.—Sodium sulphate in doses of from $\frac{1}{2}$ ounce to 1 ounce (15.5-31.1 Gm.) is an efficient hydragogue cathartic; in smaller doses, an aperient and diuretic. When in an effloresced state, the dose must be reduced one-half, on account of its having lost about one-half of its weight in water. Sodium sulphate is much less used than formerly, having been almost entirely superseded by magnesium sulphate, which is less disagreeable to take and milder in its action. Its nauseous state, however, may be disguised by the admixture of a little lemon juice or cream of tartar, or by the addition of a few drops of sulphuric acid. It is an ingredient in the artificial Cheltenham salt. De Lucas has found sodium sulphate remarkably efficient in removing stains or opacity of the cornea, if applied in the form of powdered crystals directly to the eyeball twice a day. (Journ. de Pharm. et de Chim., Sept. 1867.) The only uses of sodium sulphate in the arts are to make sodium carbonate and some kinds of glass. It has no official preparations.

"Sodium Sulphate should be kept in well closed vessels." U. S. "May be obtained from the residue left in the manufacture of hydrochloric acid from chloride of sodium, by neutralizing it with carbonate of sodium, and crystallizing from solution in water." Br.

Sulphate of Soda; *Natrum Sulfuricum*, P. G.; *Sulfas Sodicus* (*Natricus*), *Sal mirabile Glauberi*; *Vitrilated Soda*, *Glauber's Salt*; *Sulfate de Soude*, *Sel de Glauber*, Fr.; *Schwefelsaures Natron*, *Glaubersalz*, G.; *Sulfato di Soda*, It.; *Sulfato de Soda*, *Sal de Glaubero*, Sp.

Sodium sulphate, in small quantities, is extensively diffused in nature, and is obtained artificially in several chemical operations. It exists in solution in many mineral springs, among which may be mentioned those of Cheltenham and Carlsbad; and it is found combined with calcium sulphate, constituting a distinct mineral. Many ponds containing this salt are found in the country between Santa Fe and the headwaters of the Arkansas, and on the route to the Rocky Mountains. The water in one of these ponds forms a solution so highly concentrated that in dry weather the salt crystallizes on the surface to the depth of several inches, so as to have the appearance of limpid ice. (A. J. P., xii. 110.) A large deposit of Glauber's salt has been found in the Caucasus, not far from Tiflis. It is about 10 feet below the surface and was penetrated 5 feet, and probably extended much deeper. There are, besides, in the same region, lakelets containing the same salt in solution. (N. R., Oct. 1872, p. 151.) As an artificial product, it is formed in the processes for obtaining hydrochloric acid and chlorine, and in the preparation of ammonium chloride from ammonium sulphate and common salt. It may also be procured from sea water, in which its ingredients are present.

Immense quantities of sodium sulphate made by decomposing common salt by sulphuric acid, in the manufacture of soda ash and sodium carbonate (see *Sodii Carbonas*); and, so far from the general hydrochloric acid being a product of much value, its absorption in a convenient way, so as to avoid the nuisance of its escape into the atmosphere in a gaseous state, is an object of importance to the manufacturer. (See *Acidum Hydrochloricum*.) MM. Thomas, Delisse and Boucard have proposed a new process for preparing sodium sulphate, by double decomposition between sodium chloride and ferrous sulphate. This process avoids the production of hydrochloric acid vapors, and is said to furnish a cheap salt.

The residue of the process for obtaining chlorine by the action of sulphuric acid and manganese dioxide on common salt is a mixture of sodium sulphate and manganous sulphate. Large quantities of this residue are formed in manufacturing chlorinated lime (bleaching powder); and the sodium sulphate in it, roughly purified, supplies a part of the consumption of this salt in making soda ash and sodium carbonate.

The process for obtaining ammonium chloride from ammonium sulphate and common salt forms another source of sodium sulphate. By double decomposition, sodium sulphate and ammonium chloride are formed; and by exposing the mixed salts to heat, the ammonium chloride sublimes, and the sodium sulphate remains behind. (See *Ammonii Chloridum*.)

Properties.—Sodium sulphate is in "large, colorless, transparent, monoclinic prisms, or granular crystals, odorless and having a bitter, saline taste. The salt effloresces rapidly in the air, and finally loses all its water of crystallization. Soluble at 15 degrees C. (59 degrees F.), in 2.8 parts of water. The solubility increases up to 34 degrees C. (93.2 degrees F.), when its maximum is attained, 1 part of the salt then dissolving in somewhat less than 0.25 part of water; from thence it gradually decreases with rising temperature, until 1 part requires 0.47 part of boiling water for solution. Insoluble in alcohol; soluble in glycerin. When heated to 33 degrees C. (91.4 degrees F.), the salt fuses, and, on being heated to 100 degrees C. (212 degrees F.), loses all its water (55.9 per cent). At a red heat the anhydrous salt fuses without decomposition. To a nonluminous flame it imparts an intense, yellow color. The aqueous solution is neutral to litmus paper. A 5 per cent aqueous solution of the salt yields, with barium chloride test solution, a white precipitate insoluble in nitric acid. If to 5 C.c. of the aqueous solution (1 in 20) 1 C.c. of the sodium phosphate test solution and 0.5 C.c. of ammonia water be added, no turbidity or precipitate should be produced, even after agitation (absence of magnesium, etc.). The solution should not effervesce on the addition of an acid (absence of carbonate). It should not be colored or rendered turbid by the addition of ammonium sulphide test solution; or of an equal volume of hydrogen sulphide test solution, after being acidulated with hydrochloric acid (absence of arsenic and metallic impurities). After acidulation with nitric acid, the aqueous solution should remain clear, or at most be rendered only very slightly opalescent, on the addition of silver nitrate test solution (limit of chloride)." U. S. When recently prepared, it is beautifully transparent; but by exposure to the air it effloresces, and the crystals become covered with an opaque white powder. By long exposure it undergoes complete efflorescence, and falls into powder with loss of more than half its weight. A supersaturated solution of sodium sulphate will remain without crystallizing at ordinary temperatures, even though containing several times the weight of the salt that will be dissolved at the same degree of heat. But the solution instantly forms into a crystalline mass upon adding to it a fragment of the same salt crystallized, or other substances that have been exposed to the air, or upon abruptly placing it in contact with the air. M. D. Gernez appears to have proved that in each instance the cause of crystallization is the same, namely, sodium sulphate containing 10 mols. of water; and where the crystal itself is not added, the result is owing to sodium sulphate existing in the air. (See A. J. P., Sept., 1865, p. 379.) Subjected to heat, it dissolves in its water of crystallization, then dries, and afterward by the application of a red heat melts with the loss of 44½ per cent of its weight. M. Coppet has ascertained that there are two varieties of the anhydrous sulphate, one in which the salt is deprived of its water at ordinary temperature, the other in which the desiccation is effected at a heat above that of 33 degrees C. (91.4 degrees F.). The two differ in their relation to the crystallization of the salt, the former causing immediate crystallization when thrown into a supersaturated solution, the second not. (Journ. de Pharm., 1894, p. 36.) Occasionally it contains an excess of acid or alkali, which may be discovered by litmus or turmeric paper. Common salt may be detected by silver nitrate; a salt of iron by potassium ferrocyanide. This salt is not subject to adulteration. It is incompatible with potassium carbonate, calcium chloride, the salts of barium, lead acetate and subacetate, and with silver nitrate if the solutions are strong. It consists of two atoms of sodium combined with the group SO characteristic of sulphates, and crystallized with 10 mols. of water, $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$.

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DAVIS STOCK FOOD = 25 = \$3.00
POUNDS

No. 65W120
 Davis Stock Food,
 25-pound pail... **\$3.00**



Four 25-pound Pails, or 100 Pounds of Davis Stock Food, and Why You Should Have That Much.

WE STRONGLY ADVISE all owners of from five head of stock and upward to send us an order for 100 pounds of Davis Stock Food. One hundred pounds is sufficient to feed 15 head of horses or 15 dairy cows for three months. It will save you 100 bushels of feed, worth more than twice what we ask you for the 100 pounds. Davis Stock Food must have a fair show and opportunity to demonstrate its worth. It must be fed with religious regularity; just the same as you feed oats or other feeds. You must not—and we do not think that you would—expect your cows to give milk very long, or your horses to be in condition to work very long, if you did not feed them regularly, and we know that you are fair minded enough to realize that the same holds good of Davis Stock Food. Make up your mind when you buy it that it becomes just as much a part of your horse's maintenance ration as the oats and hay, and feed it not once or twice but all the time. Again, horses, cattle, sheep or hogs that have been run down and are out of condition and whose digestive systems have been deranged, perhaps for years, will not show results in a day or two. You can appreciate this fact, that it will take perhaps a month before any visible results will be obtained. But at the end of this month the change for the better will be so rapid and so apparent that you will be delighted. Your horses will then begin to enjoy life in the full sense of the word. Your cows will fill the milk pails night and morning, and your wife will be delighted with the large amount of rich cream in the milk. If you are in the dairy business, and your cows' milk has run around 3 to 4 per cent butter fat, you will be surprised to see how the percentage will increase—and all this with less feed. It is a well known and acknowledged fact that 90 per cent of the domestic animals today have indigestion in one form or another. They are consequently unable to extract anywhere near all the digestible nutrients from the feed. American feed stuffs, in the stomach or alimentary canal of the average domestic animal, will yield only about 80 per cent of their digestive nutriment. You are thus losing 20 per cent of the actual value that you are only actually losing the feed value, but the digestive juices are able to throw into solution. By the

feed which passes through the animal undigested. And this does not mean the whole animal system is deranged, and does not assimilate even as much as addition of Davis Stock Food to the regular ration, the entire system is slowly but surely brought into a normal condition. - All the glands of the digestive system are toned up and corrected, as it were; the digestive juices are properly secreted and in abundance, thus subjecting the food stuffs to the full force of the digestive system, as nature intended. The liver, the pancreas, are made to brace up and perform their normal functions. The muscular walls of the intestines are given new life and peristalsis is uninterrupted, thus preventing constipation. We know all of the foregoing, and know that every pound of Davis Stock Food will save a bushel of grain; surely a profitable proposition, which you cannot afford to overlook from any standpoint; and now—before you forget it—send us an order for 100 pounds of Davis Stock Food. You cannot afford not to do it. Just send us \$12.00, and tell us to ship it at once. Feed it all—every particle of it—and if you are not more than satisfied with the results it gives you, you cannot do us a greater favor than tell us about it and give us an opportunity to return your money. Remember, it is put up in heavy, patent, watertight wooden pails, which you can use on the farm after the stock food is used up, and which you cannot buy for a dollar from your home store.



THE FREIGHT ON FOUR PAILS, 100 POUNDS, IS VERY LITTLE, no more than it is on 25 pounds. Stock food goes at fourth class rates, and the freight on 100 pounds is about 25 to 40 cents for a distance of 250 miles, greater or less distances in proportion.

No. 65W125 Davis Stock Food. Price, for four 25-pails, or 100 pounds..... **\$12.00**



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DAVIS STOCK FOOD

2 POUND PACKAGE 25c 4 POUND PACKAGE 50c 8 POUND PACKAGE \$1.00

WE WANT YOU, if you have never used Davis Stock Food, and do not care to give us an order for 100 pounds, to send us an order for one of these different sizes. Remember, that every pound of Davis Stock Food used will save one bushel of oats or its equivalent, if fed according to directions. Your horse may be run down in flesh, his appetite may be poor, he may be troubled with worms, he may seem unable to extract any nutriment from his feed, though he eats enormous quantities. If so, send us an order for a package of Davis Stock Food, and feed it as directed (full directions sent with every package), ask our advice, if you will, and if, after having fed the entire package, you are not fully satisfied, just write and tell us so, and we will cheerfully refund your money, without quibbling or argument. You may have a cow which is run down in flesh. She may not be giving the amount of milk that she ought to, or her milk may be deficient in cream; perhaps it is ropey and stringy or blue; her appetite may be poor. If so, send us an order for one of these packages of Davis Stock Food, feed it as directed, and, if she does not give more milk and better milk and at the same time pick up in flesh, have a brighter look about the eye, just write and tell us so, saying that you are not satisfied and we will return every cent you have paid us. Perhaps you live near town and have a few pigs that you are raising to use for this winter's pork supply; you are interested in getting as good a quality of pork as possible; you want their systems to keep free from disease, because you expect to eat the meat; perhaps you are particularly fond of lean meat, or perhaps you want lard. Again, the pigs are very likely to be troubled with worms which is very detrimental, while the greatest foe in raising hogs is constipation. Davis Stock Food regulates all this. It will make a decided improvement upon the quality of the meat. If you will follow our directions, your pigs will grow fast, and lean meat will be in preponderance; or fat, if fed according to the directions for lard, and you will profit by it, it will keep their bowels and system free from worms and parasites and absolutely prevent constipation. The health of yourself and your family depends upon keeping this meat sweet, pure and clean. Davis Stock Food, if used regularly, will insure this. Just remember that it is not an expense; it pays for itself, it will make your hogs gain from one to two pounds a day a piece on less feed than you are now giving them, and when killing time comes your neighbors will envy you. Remember, that our certificate of guarantee is put on every package, that it means just what it says, and that if at any time you are not fully satisfied with the results after having used the entire package, all we ask is that you write and tell us so and give us an opportunity of returning every cent you have paid us. We know what Davis Stock Food is, and we know that it is far superior to anything manufactured in the way of stock foods today. Try it, if you will, and note the results for yourself. The ingredients of which it is composed are printed in plain letters on every package, and any druggist will allow you to see his United States Dispensatory, in which the actions of the various drugs are given. Our prices for Davis Stock Food are as follows:

- No. 65W100 Davis Stock Food, 2-pound package. Price \$0.25
- No. 65W105 Davis Stock Food, 4-pound package. Price50
- No. 65W110 Davis Stock Food, 8-pound package. Price 1.00

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25 POUNDS OF DAVIS POULTRY FOOD \$3.00

This twenty-five pound pail of Davis Poultry Food contains 16,000 feeds for one hen or it will feed 160 hens for three months, and increase the number of eggs you get from them by at least 200 dozen more. The price of this pail is \$3.00. With eggs at only 12 cents a dozen it will make you \$24.00 extra money. It will make your hen lay from 20 to 60 per cent more eggs, and in time double her production. It prevents chicken cholera and roup, cures gape and causes young chicks to grow rapidly. It enables the fowl to thoroughly digest and assimilate all of the nutritive properties of the feed, keeps her system in perfect physical condition, thus warding off disease. The ingredients used in the manufacture are printed in plain letters on the label, and our Certificate of Guarantee is on every package. Plain and complete directions for feeding are on every package.

Are your chickens lazy? Perhaps they are not laying as they should. You may have lost some from cholera. If so, don't wait an instant, but send us an order today for a 25-pound pail of Davis Poultry Food; and if it does not give you more eggs and better chickens than you ever had before, write and tell us, and we will cheerfully refund your money. Send us \$3.00 today, and allow us to ship



you this 25-pound pail. After the contents are used up you will have a nice useful pail on hand.

No. 65 W140 25-pound Pail of Davis Poultry Food. Price..... \$3.00

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A NEW DEPARTURE IN POULTRY FOODS. YOU NEVER HAD ANYTHING LIKE IT.

Send Us an Order for Davis Poultry Food Today.

FOR YOUR CONVENIENCE, we are offering it in 2-pound packages for 50 cents, and in 8-pound packages for \$1.00. In addition to this it is put up in 25-pound pails, and it is this latter quantity that we recommend you to purchase. The formula, telling you exactly what DAVIS POULTRY FOOD is made of, is printed in plain letters on every package, and every package contains a **CERTIFICATE OF GUARANTEE** that entitles you to **YOUR MONEY BACK** if you are not fully satisfied—and that certificate means exactly what it says. **WE ARE BLAZING A NEW PATH IN THE STOCK AND POULTRY FOOD BUSINESS.** We have adopted a new policy—that of taking the customer into our fullest confidence. We are entering this field, not for today or tomorrow but for all time; and we expect to build up the largest Poultry Food business in the world. We cannot do this without your assistance. We cannot do it unless all of our customers and the purchasers of DAVIS STOCK FOOD or DAVIS POULTRY FOOD are fully satisfied as to their respective merits. We cannot do this unless we live up to our word and our guarantee to the letter. And your knowledge and experience in your dealings with SEARS, ROEBUCK & CO. is sufficient guarantee as to the worthiness of the certificate you will find on every package.

CAN YOU AFFORD TO BE WITHOUT IT?

AND JUST REMEMBER that we want you to give DAVIS POULTRY FOOD a thorough trial. It will make your hens **strong and healthy**; it will **increase** their egg laying capacity; it will **insure** good, strong, healthy chicks; it will make the chicks grow strong and fast with a lower cost of production than you ever dreamed of, and, taken all in all, DAVIS POULTRY FOOD makes the poultry business more than profitable.

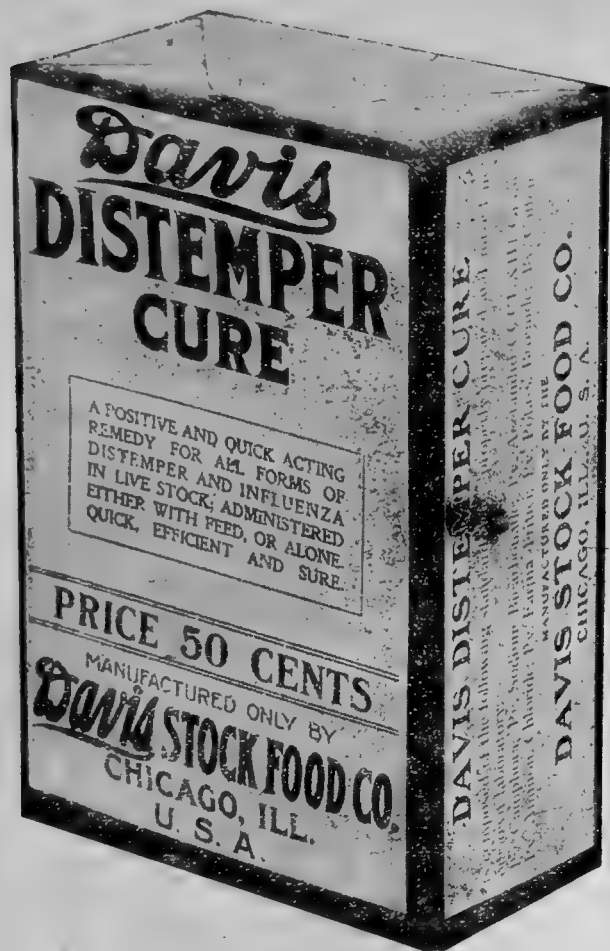
DON'T forget to send us an order **right now** for DAVIS POULTRY FOOD. Remember, it is **fully** guaranteed, and all we ask of you is to give it a thorough and fair test; and if you are not fully satisfied after having used the entire package, just say so, and we will cheerfully refund every cent you have paid us. A 2-pound package is 25 cents, a 4-pound package is 50 cents, an 8-pound package is \$1.00, and a 25-pound pail, \$3.00.

No. 65W130	Davis Poultry Food, 2-pound package.	Price	\$0.25
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Davis Distemper Cure.

A POSITIVE, QUICK ACTING REMEDY FOR COUGHS, COLDS AND ALL OTHER FORMS OF DISTEMPER. QUICK, EFFICIENT AND SURE. SOLD UNDER A SPOT CASH GUARANTEE—YOUR MONEY BACK IF IT FAILS.

DAVIS DISTEMPER CURE is wholly unlike the many distemper cures now on the market; it is composed of strictly pure drugs and medicines and is a formula used by the best veterinarians in the country, and one which is guaranteed to cure the most stubborn cases. It is the best known remedy for quickly relieving coughs, colds, distemper or influenza.

DISTEMPER IS A COMMON AILMENT AMONG HORSES and in some of its forms is contagious. An animal suffering with this disease is not in condition to work or drive, and neglect of this affliction frequently brings on other complications which sometimes permanently disable the animal and generally affect its usefulness to such an extent that it greatly depreciates in value. It is a comparatively easy

matter to treat successfully all forms of distemper in their early stages, and it is for this reason that we recommend to every live stock owner the purchase of **DAVIS DISTEMPER CURE**, whether his horses have this disease at the present time or not. The amount represented in the purchase price is so small, and its value to you when needed is so great, that it pays to keep it constantly on hand. Upon the appearance of the first symptom of a cough or cold, or the most aggravated forms of distemper, the use of this remedy according to printed directions will bring quick and certain relief.

IT SHOULD BE REMEMBERED, especially in cases of distemper which are well developed, that in connection with the use of **DAVIS DISTEMPER CURE** a great deal will depend on the sort of treatment the animal receives at your hands, and as distemper in its several forms generally makes its appearance in an animal which is run down, and whose system is more or less debilitated, a cure may be more speedily effected, the animal may be restored to a strong, healthy condition more quickly, if you will feed **DAVIS STOCK FOOD**, as described elsewhere in this book, in connection with this treatment, and in connection with the daily rations of the animal. In many years' experience one of the leading veterinarians of the country has declared this remedy the very best preparation he has been able to discover for the treatment of distemper, and, as it has proven so thoroughly satisfactory in so many cases, we unhesitatingly guarantee it to be strictly first class in every respect, to be the very best distemper cure offered by any firm or individual, and if you order it and use it according to directions, and it fails to do all we claim for it, we will be glad to refund your money and pay the transportation charges both ways upon notification of its failure and dissatisfaction on your part.

Regular price, per box, 50 cents.
 Sears, Roebuck & Co.'s Catalogue No. 65W710 Price, per box, **39c**
 If by mail, postage extra, per box, 16 cents.

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Davis Veterinary Blister.

DAVIS VETERINARY BLISTER is put upon the market to meet the demand of the horseman for a safe, efficient blister, to use in the treatment of bog spavin, blood spavin, wind puffs, calluses and sprains. It is composed of Amber Petrolatum, Cera Flava, and P_v. Cantharides, being a prescription used by veterinary surgeons the world over. It is simple, harmless and efficient, and should be kept in every barn, as it does not deteriorate in value, being put up in strong tin boxes, securely sealed. In the majority of cases, if a curb is treated immediately upon its appearance with **DAVIS VETERINARY BLISTER**, it will be entirely removed. Davis Veterinary Blister is fully guaranteed, and your money will be cheerfully refunded if it ever proves unsatisfactory.

If you are a horse owner, get a box and keep it on hand. It is the cheapest insurance you ever had.

Regular price, per box, 50 cents.

Sears, Roebuck & Co.'s Catalogue No. 65W720 **39c**
 Price, per box.....

If by mail, postage extra, per box, 4 cents.

DAVIS OPHTHALMIA SPECIFIC.

BY THE TERM "OPHTHALMIA" is meant an inflammation of the eyeball. There are two forms of it; simple and periodic. Simple Ophthalmia is usually the result of an injury, inflicted either directly or indirectly, such as a blow from a whip, presence of a foreign body such as sand, grain, dust, etc., in the eyes, foul air in the stables, extremes of heat or cold, etc. The periodic form is a constitutional affection. It is commonly known as moon blindness or moon eye. The causes of periodic Ophthalmia are little understood. Extremes of heat or cold often serve as exciting causes, but prominent authorities claim that the disease in itself, in all probability, must exist within the system in a latent form, and any exciting cause that brings it on only serves to develop it.

SYMPTOMS OF SIMPLE OPHTHALMIA. There is a copious flow of tears. The eyelids, particularly the upper ones, become swollen to a considerable extent and are reddened and inflamed. The chief difference between simple Ophthalmia and periodic Ophthalmia is that the exudate, when the condition occurs as the result of an injury, moves from the seat of the injury toward the circumference, while in periodic Ophthalmia the opposite takes place.

SYMPTOMS OF PERIODIC OPHTHALMIA. Periodic Ophthalmia occurs suddenly. The animal may seem all right at night, while the next morning either one or both eyes will be found to be swollen and sore, a drooping of the eyelid and a slight reddened condition of it. As the disease advances the eye loses its brilliancy and presents a yellowish brown appearance. In periodic Ophthalmia a great many cases can only be relieved, and the disease will reappear from time to time, some of the cases resulting ultimately in total blindness. But if **DAVIS OPHTHALMIA SPECIFIC** is used immediately upon the appearance of the disease, it is possible, in a great majority of cases, to gradually wear the disease out.

DAVIS OPHTHALMIA SPECIFIC is prepared from a well known prescription thoroughly tried and tested. It is easy to administer and fully guaranteed; money being cheerfully refunded if at any time it proves unsatisfactory.

Regular price, 50 cents per bottle.

Sears, Roebuck & Co.'s Catalogue No. 65W550 Price, per bottle..... **39c**

If by mail, postage and packing extra, 3 cents.

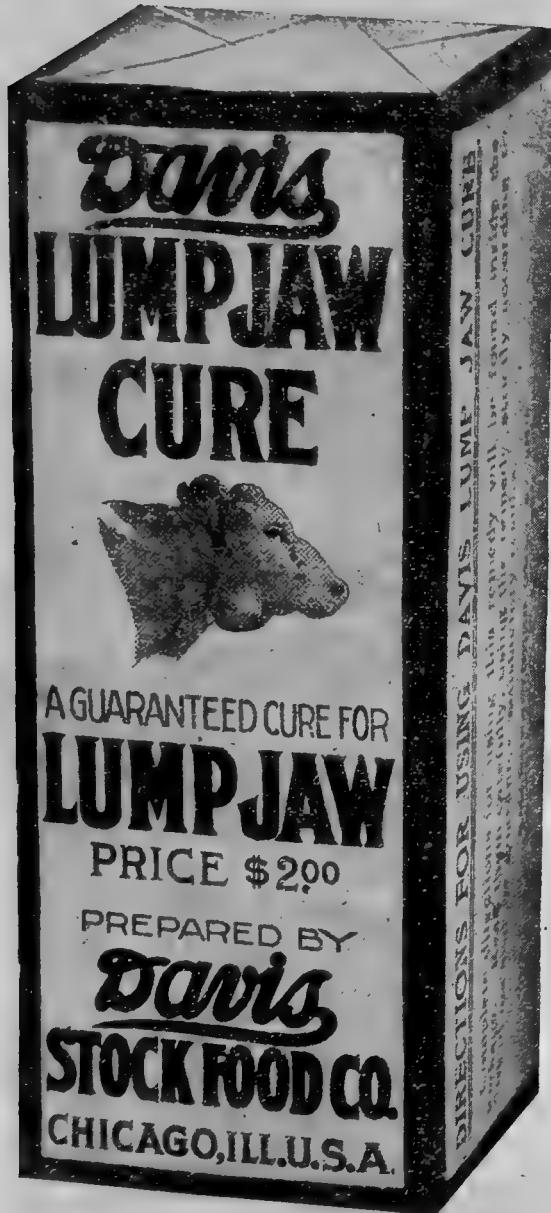


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DAVIS LUMP JAW CURE.

A POSITIVE SPECIFIC FOR CURING THIS SERIOUS AFFECTION.



LUMP JAW, technically known as Actinomycosis, or Lumpy or Big Jaw, is a plague rapidly becoming prevalent.

While several years ago it was little known, it has grown of late to tremendous proportions, and is now one of the commonest of ailments among cattle.

A PARASITIC DISEASE. Lump Jaw is a germ disease, caused by a vegetable germ or fungus, named Actinomyces or Ray Fungus. This fungus is found upon pasture grasses, about straw stacks, barnyards, upon beards and husks of barley, being usually spread about by some animal having the disease. While the fungus may penetrate the tissues in various parts of the body, they usually gain entrance through the mucous membrane of the mouth. Healthy cattle, in eating the plants upon which the fungus is growing, eat the germs with it, and when they find lodgment in a punctured membrane of the mouth, or gain lodgment at the side of the teeth, the animal becomes infected, and the disease starts from this point and invades the neighboring parts. It is a well known fact that the membrane about the jaws, especially the connective tissue beneath the skin of the jaws, is particularly liable to scratches, which accounts for the fact that the disease nearly always starts in this part.

EARLY STAGES. When once the fungus fastens itself in the membrane of the mouth, it multiplies with great rapidity, eventually destroying both flesh and bone. Lump Jaw can first be detected by the presence of a swelling, and later one or more hard lumps appear upon either the jaw bone, cheek, or below the ear between the lower jaw and the neck, but most frequently on the external surface of the jaw. When these are first noted it is the best time to kill the growth of the disease, as a few applications of **DAVIS LUMP JAW CURE** at that time will quickly kill all the fungus and remove every trace of the disease. The longer you put off treatment the more the disease spreads, the bone becomes affected and it is then much more difficult to cure. In the early stages the lump usually softens and an abscess forms, which, increasing in size, at last breaks, and all this foul pus and poisonous matter begins to discharge. Here, then, arises the great danger of infection. This poisonous matter, loaded with fungi, becomes distributed about the pasture and wherever the animal is confined, endangering the animals which have not been infected. While the disease is confined to the head, the cure by Davis Lump Jaw treatment is certain, but, if neglected at this stage, the disease will rapidly spread, involving the entire alimentary tract, together with the liver, and in the great majority of cases it will attack the lungs, for which there is no cure.

DAVIS LUMP JAW CURE is the result of many years' study and veterinary practice, with a complete understanding of the causes and effects of lump jaw. It is a dark red liquid for external application, possessing remarkable penetrating power. It is rubbed upon the part, and within a few moments penetrates every fiber and tissue of the affected part. Its antiseptic and healing action commences at once, and a few applications will cure every case of genuine lump jaw in which the bone has not been too heavily affected. When once the cause of the disease has been removed, nature will proceed to throw off the dead tissue, and this remedy, inducing the growth of healthy tissue, will aid nature in rebuilding the diseased part.

GUARANTEED. We absolutely guarantee **DAVIS LUMP JAW CURE** to do all we claim for it, and will cheerfully refund your money if it fails in any case.

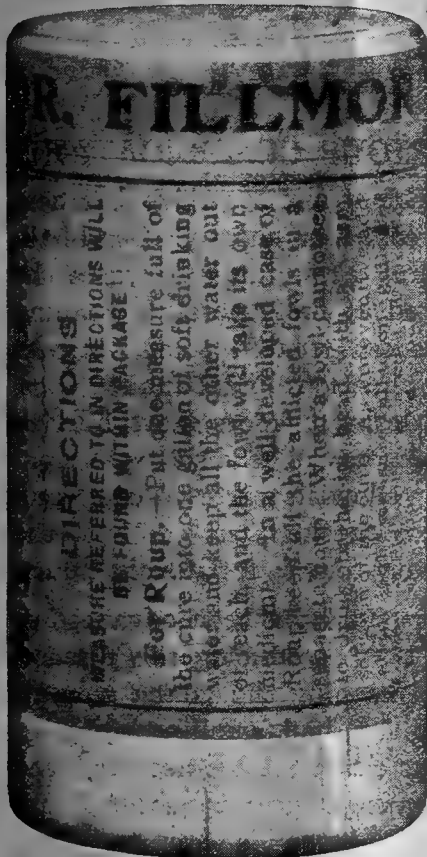
Regular price, per bottle, \$2.00.
 Sears, Roebuck & Co.'s Catalogue No. 65W610 Price, per bottle..... **\$1.29**
 If by mail, postage and packing extra, 10 cents.

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DR. FILLMORE'S ROUP CURE.

THE ONLY GUARANTEED CURE FOR ROUP IN ANY FORM.

ROUP IS A VERY PREVALENT DISEASE AMONG CHICKENS

and exists in many forms. It is usually caused by the chicks roosting in the open air and catching cold, which soon develops into roup. The symptoms comprise hoarse breathing, swelled heads and eyes, discharge from the nostrils, and in the malignant and contagious form it is accompanied with a very foul odor. It rapidly saps the vitality of the bird and in a short time the chick appears weak and drooping, and death follows unless relief comes promptly.

DR. FILLMORE'S ROUP CURE is the only sure treatment. One small measure (included in package) is filled with the powder which is dissolved in one gallon of drinking water. All the other water should be removed and the chicks will gladly take the medicine. In a well developed case of roup, keep all the affected fowls in a separate coop. When a fowl cannot see to cure. As a preventive for the remainder of the lon of water, and give this solution as drinking water. This will cure a cold in three or four days. But a well developed case of roup will require from two to three weeks.

IF YOU RAISE CHICKENS

you will need this splendid remedy and at our special price it is a very profitable adjunct to every poultry keeper's medicine chest.

Regular price, per box, 50 cents.
Sears, Roebuck & Co.'s Catalogue No. 65W590 Price, **39c**
per box.....

If by mail, postage and packing extra, 4 cents.

DAVIS VETERINARY LINIMENT

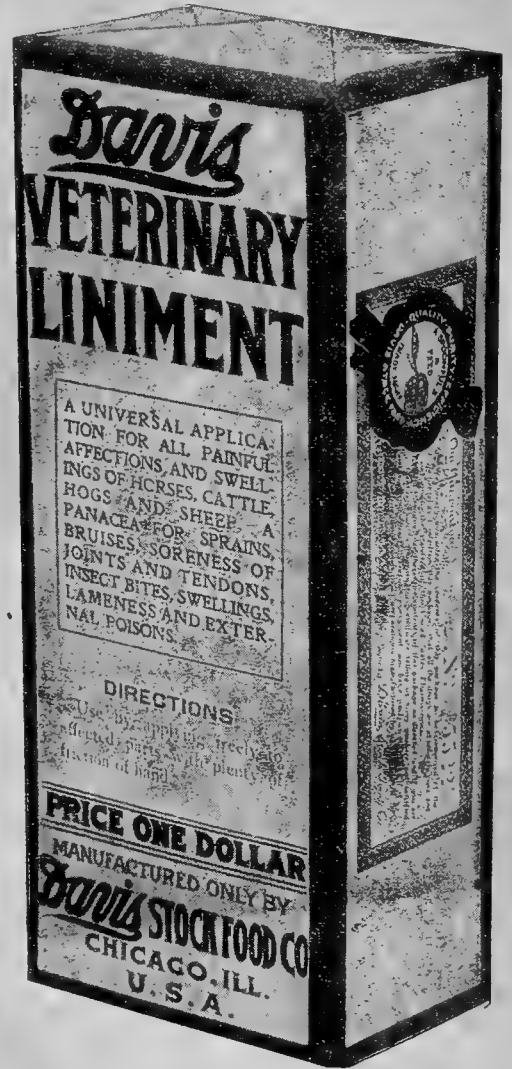
THE MOST REMARKABLE CURATIVE LINIMENT

ever made in any country or age, curing many forms of disease and banishing pain with wonderful success; liniment that penetrates muscle, membrane and tissues, relieving more ailments than anything ever offered to the veterinarian or stock raiser.

DAVIS VETERINARY LINIMENT penetrates the muscles, membranes and tissues to the very bone and becomes distributed throughout the entire system. Oils will not do this, nor will liniments having an alcoholic basis. Try the effects upon yourself—wash your hands thoroughly clean with hot water and soap, dry and then anoint the palms of your hands with a small quantity of the liniment, warming the hands and reapplying until no more will be absorbed; then wash the hands perfectly clean. In three to three and one half hours later the peculiar odor of Davis Liniment will be plainly noticed in the urine voided. This should prove to you more conclusively than any amount of talking that Davis Veterinary Liniment is not like other liniments, which merely affect the outside, but that it is the one liniment that penetrates the parts, becomes distributed throughout the system and positively cures the ailment.

INDISPENSABLE TO STOCK OWNERS. All ailments of stock should be promptly treated with the very best remedies obtainable. The Davis Veterinary Liniment should be used on horses, cattle and other stock in cases of swelling, lameness, strains, enlarged joints, sprains, inflammation, etc. In coughs, colds, sore throat, etc., it should be applied to the throat and windpipe and rubbed in thoroughly. A very beneficial leg wash can be made by adding 1 or 2 tablespoonfuls of Davis Veterinary Liniment to 1 quart of warm water and thoroughly bathing the legs.

Regular price, per bottle, \$1.00.
Sears, Roebuck & Co.'s Catalogue No. 65W570 Price, per bottle **79c**
Unavailable on account of weight.



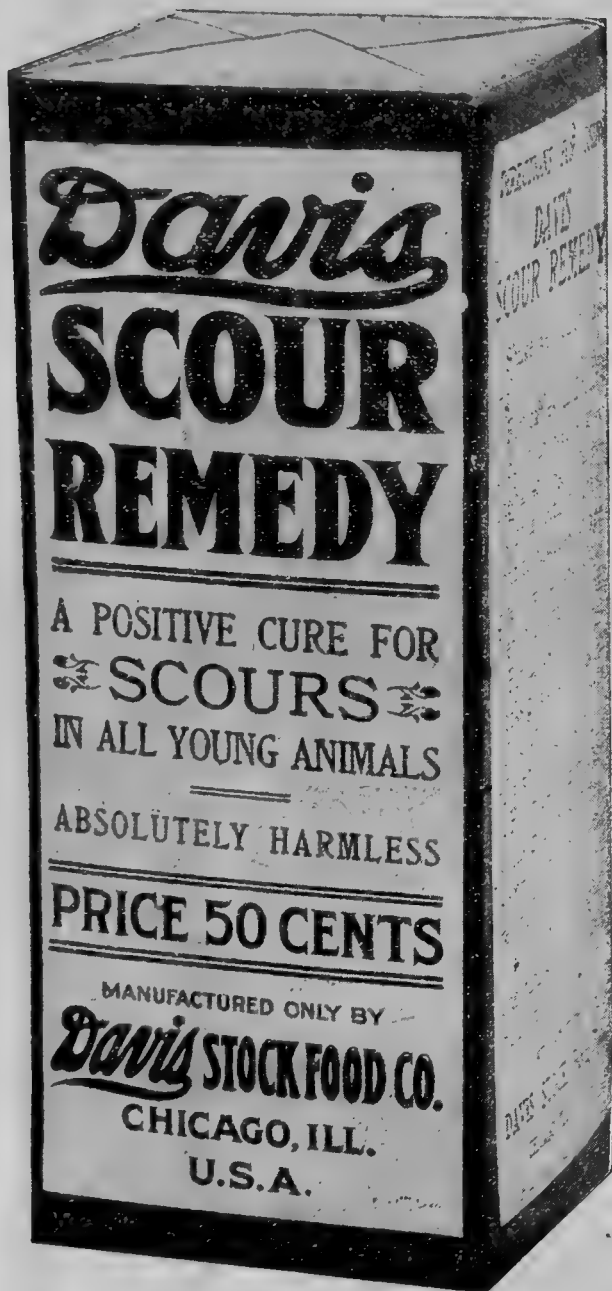
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DAVIS SCOUR REMEDY.



ONE OF THE MOST SERIOUS COMPLICATIONS

in young calves and colts is violent and excessive diarrhea, known as scours. It usually comes on shortly after birth, but may not appear for several days. In mild cases the symptoms are not very marked at first, merely a running off from the bowels, but unless treated soon becomes serious and the following complications arise: sunken eyes, dullness, low temperature, no desire for food, short, hurried breathing and excessive weakness. The discharges from the bowels are very heavy, yellowish white in color and very offensive in odor. Unless checked, the death of the animal may result within twenty-four to forty-eight hours.

MANY DIFFERENT CAUSES have been advanced as producing this disease.

Some authorities ascribe it to keeping the young animals in closed stables, the close, filthy, bad smelling buildings causing the complaint. Others claim the disease produced by a germ. Whatever the cause, it is very serious, and unless immediate attention is given is apt to cause material loss of live stock. In all such cases **DAVIS SCOUR REMEDY** will bring immediate relief.

It differs in every respect from anything else on the market. IT STANDS IN A CLASS BY ITSELF.

It not only stops the diarrhea by removing the cause, but it tones up the stomach of the young animals, decreases the griping and scouring, checks the intestinal irritation, increases the appetite, sweetens the stomach and aids digestion. It effects a speedy and permanent cure and strengthens the animal by freeing it from the disease and enabling it to properly digest its food. It is guaranteed to do just what we say it will and you can put every confidence in the results. Money cheerfully refunded if it fails.

Regular price per bottle, 50 cents.
 Sears, Roebuck & Co.'s Catalogue No. 65W670 Price, per bottle **39c**
 If by mail, postage and packing extra, 12 cents.
 Regular price, large bottle holding three times the 50-cent size, \$1.00.
 Sears, Roebuck & Co.'s Catalogue No. 65W671 Price, large bottle holding three times 50-cent size **79c**
 Cannot be mailed.

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DAVIS STABLE DISINFECTANT.

There are Innumerable Disinfectants on the Market, Some Good, Some Bad, Some Indifferent.



WHEN YOU GO TO THE EXPENSE OF BUYING

A DISINFECTANT and using it, it goes without saying that it should be efficient. To be inefficient is dangerous. In using it you should have a perfect right to feel safe—to feel that you have taken all possible precaution toward stamping out disease, to feel that your herd or flock is protected. Should the disinfectant not be a germicide it would work irreparable harm. We regret to state there are many disinfectants on the market that accomplish nothing more than replacing one foul odor with another, and if their bacteria and germ killing properties were stronger than their odors you would have no cause to fear. But that is just the trouble; they are not. It therefore behooves the stock raiser to select his disinfectant with care; to know that the disinfectant he is buying is efficient; to know that it is honest and will accomplish its work. He should insist upon knowing that, in the first place, it contains standard chemicals and drugs; and, in the second place, that they are used and mixed properly; and in knowing this he is able to judge for himself as to just what degree of efficiency he may expect. As the health of himself and his family so largely depends upon the health of his animals, it is especially important that he exert every effort to control and eradicate disease. The old, old adage, that "An ounce of prevention is worth a pound of cure," was never more applicable than in this connection.

The Primary Causes of Practically all the Diseases

are now recognized to be bacteria, germs and parasites. Bacteria multiply either inside or outside the body, often forming compounds and gases that enable us to recognize them. Different substances may be used to counteract these disagreeable odors, but removing the odor does not remove the cause. Many manufacturers of disinfectants evidently work on the principle that in destroying the noxious odors they remove all danger. We can tell you positively that they do not; that there are many and innumerable substances that will act as deodorizers, but which are not germ destroyers. The United States government has literally spent fortunes in preaching the doctrine of prevention by the use of disinfectants, germicides and parasiticides. The barn in which you keep your horses should be thoroughly and regularly disinfected, so that the air remains pure and sweet. It is particularly important in the dairy barn if you would have your milk pure. It is absolutely essential if you would keep your hog house free from infection and disease germs, if you would reap the profit which rightly belongs to you. Formerly, and to a greater extent today, carbolic acid has been the standard disinfectant, used in solutions varying from 1/2 to 5 per cent. But it was, and is, open to many objections. First, the strong, pungent, irritating odor; second, the expense; third the danger in its use. This led the government and various scientists to researches for a safe, efficient and economical substitute. The question was finally solved by many who were able to make an emulsion of crude coal tar products. Some of these were, and are, efficient; others are nothing more or less than deodorizers. **DAVIS STABLE DISINFECTANT** is made from crude Cresol, acknowledged by the United States government and the world authorities on the subject to be the most effective substance known in fighting germs, bacteria and parasites. The crude Cresol is treated with resin soap, and goes through a process of manufacture, perfecting what is known as an emulsion that is soluble in water. Extensive, exhaustive experiments and tests have demonstrated that a 2 per cent solution of **DAVIS STABLE DISINFECTANT** is equal to and stronger than a 5 per cent solution of carbolic acid. It is at the same time much less harmful and is nonpoisonous. In all ordinary cases a 1 per cent solution will accomplish the desired results. This means that a 1-gallon can of **DAVIS STABLE DISINFECTANT** will make 100 gallons of disinfectant ready for use, and 100 gallons of disinfectant should last the ordinary farmer five or six months if properly used. Surely, you will agree with us that you cannot afford to be without it. It is certainly the cheapest insurance you ever purchased, and you have the satisfaction of knowing that the danger of the disease among your stock is reduced to a minimum. Whether you purchase

Davis Disinfectant or not, we earnestly advise you to purchase and use regularly a good disinfectant. It is to your advantage and for your own welfare. There are others on the market undoubtedly just as good as the Davis Disinfectant, and, while we would like you to use **DAVIS STABLE DISINFECTANT**, because we know just how it is made, because we know just how efficient it is, this does not mean—and we do not claim for a minute—that it is the only disinfectant on the market. We would like very much to have you send us an order for a trial gallon of Davis Disinfectant. Let us ship it to you; use it and satisfy yourself of its quality. Then, if you are not entirely satisfied with it, you can do us no greater favor than to write and tell us so, thus giving us an opportunity of returning every cent that you have paid us. We think that the Davis Preparations are the best preparations in the world for their respective uses. We know what materials are used, and we know that they are manufactured and put together in an honest manner. It is to your interest to satisfy yourself on this point. We confidently expect to build one of the largest businesses of this kind in the world on Davis Preparations. We could not do this unless they possessed merits, and we cannot do this unless every purchaser of them is thoroughly satisfied; so send us an order today, and if you are going to use disinfectants, by all means use **DAVIS STABLE DISINFECTANT**. It is put up in 1-gallon and 5-gallon cans for your convenience.

Regular price, 5 gallons, \$5.00
 Sears, Roebuck & Co.'s Catalogue No. 65W621 **\$3.85**
 Price, 5 gallons

Regular price, 1 gallon, \$1.25
 Sears, Roebuck & Co.'s Catalogue No. 65W620 **99c**
 Price, per gallon

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DAVIS FISTULA AND POLL EVIL CURE.



THE ONE GUARANTEED CURE. NO CUTTING. EASY AND SIMPLE TO APPLY. CURES MOST CASES IN THIRTY DAYS, LEAVING THE HORSE SMOOTH AND SOUND. MONEY CHEERFULLY REFUNDED IF IT FAILS.

NO EXPERIENCE REQUIRED to cure either disease with

Davis Fistula and Poll Evil Cure. Fistula and Poll Evil are two diseases of horses which heretofore have been regarded as practically hopeless. Both diseases are caused by an injury, inflammation, swelling, breaking down of tissue, pus and discharge of matter following, and, if not checked promptly, blood poisoning and death of the animal may result. Davis' well known cure subdues all the inflammation, checks the formation of pus, and, by means of its alterative action, restores the surrounding tissues to a healthy condition and promotes the healing. These three valuable properties combined in one is what makes Davis Fistula and Poll Evil Cure such a remarkable veterinary remedy, as one or two applications before the disease has developed fully will usually suffice to cure the trouble. In advanced cases the treatment is the same, except that the disease, having a stronger hold upon the system, requires longer treatment.

FISTULA OF THE WITHERS is a disease beginning with

acariasis of the bone. From the backbone projecting upward into the flesh are many small projections or spines, and these are especially liable to injury. This injury may arise from many causes, but mostly from pressure of the collar or saddle, or from the horse rolling on something hard. A slight bruise may then cause inflammation; a swelling follows, the surrounding tissues become involved and break down into matter or pus, and on the outside over the spot the flesh becomes diseased and of a soft, spongy nature. The pus accumulating on the inside gradually works itself to the surface for discharge and as this foul matter is all the time accumulating as long as the disease is unchecked, the channel for discharge must be kept open, and, being open and discharging, soon becomes coated with a membranous lining and is known by most people as the "pipe." In fact, many people think that a fistula is simply a pipe and that by removing the "pipe" the disease will be cured. Attempts to cauterize the pipes with caustics, and hence destroy the disease, aggravate many cases. The pipe, being the channel of discharge must be there as long

as the disease exists, and to cure the fistula we must go deeper and get the cause of the disease, which is exactly what DAVIS FISTULA AND POLL EVIL CURE DOES.

POLL EVIL is merely another form of fistula, and appears behind the ears of the horse. Like fistula, it is caused by a bruise, one of the first symptoms being a swelling on one or both sides. These swellings may form quickly and be accompanied by heat and be painful to the touch, or they may be slow in making their appearance and be neither hot nor tender. Nevertheless, they will in time develop into fistula, and the treatment should be applied as soon as noticed. The symptoms of pus and discharging matter are the same as in fistula, and by treating in the early stages with DAVIS FISTULA AND POLL EVIL CURE, the disease can be readily cured before it reaches the fistula stage.

TREATMENT. Complete directions for treatment of Fistula and Poll Evil, a booklet on this disease, its treatment and cure, accompany every package.

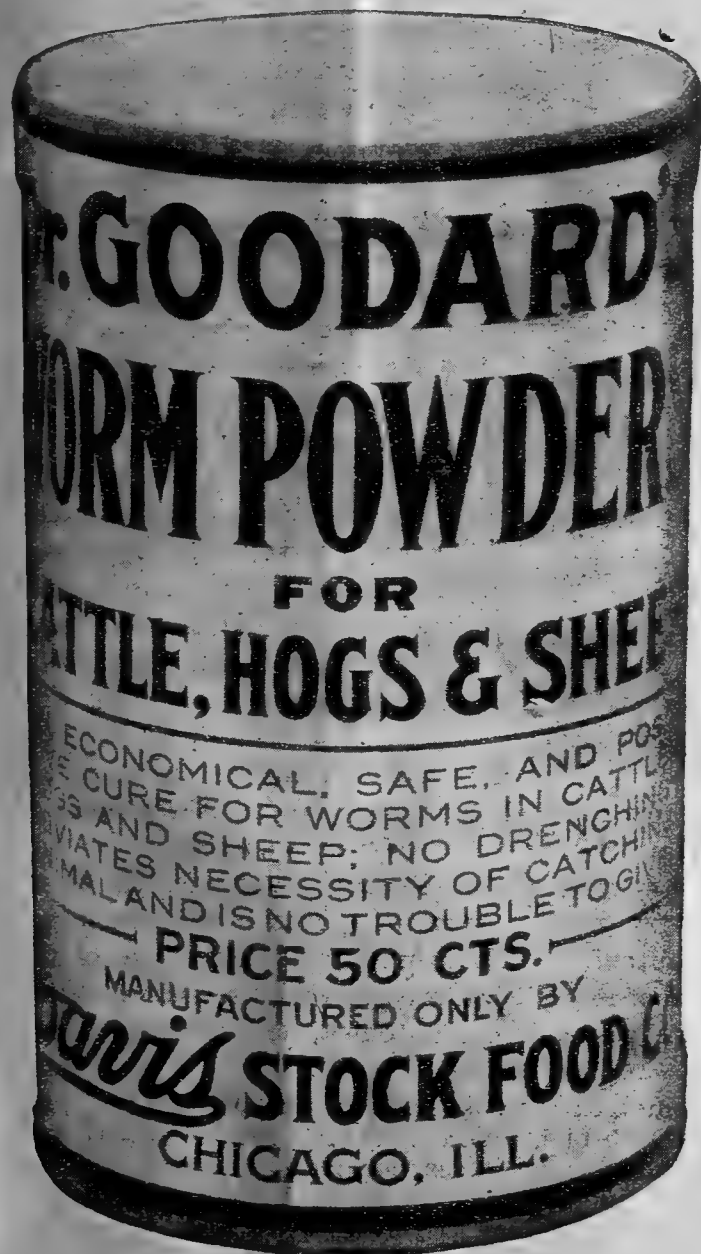
WE GUARANTEE DAVIS FISTULA AND POLL EVIL CURE TO DO EXACTLY WHAT WE SAY IT WILL AND WILL GLADLY REFUND TO YOU ALL THAT YOU HAVE PAID FOR THE REMEDY IN ANY CASE WHERE IT FAILS. ORDER A BOTTLE AND HAVE IT ON YOUR BARN SHELF READY FOR EMERGENCY.

Regular price, per bottle, \$2.00.
 Sears, Roebuck & Co.'s Catalogue No. 65W520. Price, per bottle **\$1.29**
 If by mail, postage and packing, 10 cents extra.

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GOODARD'S WORM POWDERS.



Dr. Goodard's Worm Powders

are put up in one and three-pound packages. They are prepared especially for cattle, hogs, and sheep. The enormous losses in the live stock industry due directly to intestinal parasites make the use of a good, safe worm powder of known quality essential. The United States Government has spent thousands of dollars in an attempt to rid the Western ranges of intestinal parasites, but with little or no success.

Dr. Goodard's Worm Powders

are prepared from a prescription long in use by the most prominent veterinarians in the country. A list of the ingredients is printed in plain letters on every package, so that you may know exactly what you are using. They are wonderfully effective and easy to administer, it being unnecessary to catch each individual animal, as the powders are administered in the feed.

A Wormy Animal is never a profitable animal. **DR. GOODARD'S WORM POWDERS** are fully guaranteed. We know just what they will do, and we know that they are the best that can be manufactured, regardless of expense. We want you to try them, and if they are not entirely satisfactory, we will cheerfully refund the purchase price.

Regular price, per 1-pound package, 50 cents. **39c**
 Sears, Roebuck & Co.'s Catalogue No. 65W691 Price, per 1-pound package.....
 If by mail, postage extra, 18 cents.

Regular price, per 3-pound package, \$1.00. **79c**
 Sears, Roebuck & Co.'s Catalogue No. 65W692 Price, per 3-pound package.....
 If by mail, postage extra, 54 cents.

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DAVIS WORM POWDERS FOR HORSES.



THE HAVOC CREATED

among horses by parasites of the alimentary canal is only too well known to the horseman. It is a foregone conclusion that no horse is at his best when infected with intestinal parasites. While many of them are more or less harmless, a great majority of them are not only responsible for the numerous and common diseases of the horse, but in a great many instances are directly responsible for the death of the animal. In all ordinary cases where DAVIS STOCK FOOD is used regularly there is small likelihood of worms ever gaining any foothold in the alimentary canal, but in cases where

DAVIS STOCK FOOD is not used regularly, or under exceptional conditions, specific treatment is necessary, and it was to meet such a contingency that Davis Worm Powders were prepared.

PERHAPS ONE OF THE BEST KNOWN VERMIFUGES, or remedies known for the treatment of worms in the alimentary

canal, is Santonin, the active principle of Santonica. Santonica, or Levant Worm Seed, is one of the ingredients of DAVIS STOCK FOOD, and is used because of its well known properties for the destruction of worms. Santonin is, as above stated, the active principle of Santonica, and is many times stronger than the original drug.

Pv. Hydrag. Chlor. Mides, or properly known as calomel, exerts a specific action on the liver, increasing its secretions, thus flooding the alimentary tract with bile, which is nature's remedy for worms.

Sodii Bicarbonas is used to increase the secretions of the gastric juices, correcting the acidity of the stomach. It is very effective in correcting the disturbances to digestion caused by worms, and also counteracts the flatulence resulting from a disordered digestive system.

THE FOREGOING DRUGS are combined in the proper qualities, properly mixed in our factory, and the mixture is Davis Worm Powders, positively the best remedy for intestinal parasites ever known. All we ask is that you use them according to the directions. Give them a fair show, and if they are not entirely satisfactory your money will be promptly refunded, no matter from whom you purchased them.

Regular price \$1.00 per package of 12 powders.

Sears, Roebuck & Co.'s Catalogue No. 65W750 Price, per package of 12 powders. **79c**

If by mail, postage and packing extra, 6 cents.

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DAVIS GALL CURE.

**THERE IS PERHAPS
 NOTHING SO PROMINENT**



among work horses as galls. While not especially serious in their nature, if not treated they quickly become chronic, often running into abscesses. In addition to this they cause the animal considerable pain, and no horse can work as readily if compelled to do so with numerous galls under the harness. The time to treat galls is the moment they appear, before they become chronic, and for their treatment the Davis Stock Food Company manufactures two preparations. The first of these is known as DAVIS GALL CURE, and is, we think, without any exception, the best gall cure that is manufactured in the United States today. It is composed of the following standard drugs, properly mixed and prepared in our own factory, under the supervision of an expert manufacturing chemist:

- | | |
|--------------------|-----------------|
| Digallic Ac., | Plumbi Acetate, |
| Zinci Oxidum, | Acetate Cap., |
| Crys. Ac. Carbolic | Cera Flava, |
| Acidum Boricum, | Plumbi Oxide. |
| Yellow Petrolatum, | |

Digallic Ac. is one of the most effective astringents known and Acidum Boricum, a nonirritating, antiseptic and healing agent, in almost universal use, is a stimulant, astringent and antiseptic, especially useful in the treatment of wounds, sores, ulcers, etc.

Zinci Oxidum is an external application, acts as a stimulant to the circulation, is astringent and antiseptic. Especially useful in the treatment of sores, wounds and ulcers, relieving the tenderness and itching attendant upon skin diseases.

Crys. Ac. Carbolicum, one of the oldest and best antiseptics, universally used in the treatment of wounds, sores, etc.

Plumbi Acetate and Plumbi Oxide, externally astringent, mildly antiseptic and anodyne "meaning against pain," and slightly stimulating the absorption of the deposits of inflammatory products.

Yellow Petrolatum and Cera Flava, both healing, but their chief use in DAVIS GALL CURE is as a vehicle for the proper distribution and application of the other ingredients.

IT WOULD BE MUCH EASIER FOR US to make a cheaper gall cure—not only easier, but it would be much more profitable—but in the entire line of veterinary remedies we feel that the greatest profit is to be derived from an enormous sale. We have, therefore, spared no expense or time in making every individual remedy the best that science and practice can devise, and the cost has been a secondary matter. In all honesty we can say to you that DAVIS GALL CURE is positively the best that we know of. We want you to try it, and if you are not entirely satisfied with the results you can do us no greater favor than tell us so, and give us an opportunity of refunding every cent you have paid.

- | | | |
|--|--------------------------------------|-----|
| Regular price, per 3-ounce box, 25 cents.
Sears, Roebuck & Co.'s Catalogue No. 65W640 | Price, per 3-ounce box..... | 19c |
| | If by mail, postage extra, 4 cents. | |
| Regular price, per 8-ounce box, 50 cents.
Sears, Roebuck & Co.'s Catalogue No. 65W641 | Price, per 8-ounce box..... | 45c |
| | If by mail, postage extra, 8 cents. | |
| Regular price, per 1-pound box, 90 cents.
Sears, Roebuck & Co.'s Catalogue No. 65W642 | Price, per 1-pound box..... | 79c |
| | If by mail, postage extra, 16 cents. | |

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For the benefit and convenience of the many customers of Sears, Roebuck & Co., we state underneath each preparation the Sears, Roebuck & Co. catalogue number and price, so that if you want to order any of these preparations you may order direct from Sears, Roebuck & Co., Chicago, giving their catalogue number and allowing their price.
 Do not send any orders to us (Davis Stock Food Co.), but address all orders to Sears, Roebuck & Co., Chicago.

DAVIS HEALING POWDER.

THIS IS ANOTHER PREPARATION for the treatment of galls, wounds, sores, abrasions, etc., and is a radical departure from the remedies heretofore available for treatment of such conditions. The package in itself is much recommended, as the powder is put up in a glass bottle with a nickel-plated sifter top, and the powder is dusted on the gall, wounds or abrasions without removing the cover, making it extremely handy for use and protecting the remedy against dirt and deterioration.

DAVIS HEALING POWDER is composed of the following standard ingredients, properly mixed and prepared in our own factory under the supervision of an expert manufacturing chemist:

- Aluminum Sulph. Potass.**, acts as a stimulant, astringent and a mild costive.
- Phenol**, a standard disinfectant, antiseptic and healing reagent; in universal use.
- Pv. Camphora**, externally acts as a stimulant, very slight counter irritant and allays itching and pain in skin diseases.
- Boracic Ac.**, one of the best and safest antiseptics. Allays all pain; promotes healthy growth, relieves itching.

IF YOU ARE IN NEED of such an article as **DAVIS HEALING POWDER**, give it a trial. You will be highly pleased with the results, and we know that we will have gained a permanent customer. Your money cheerfully refunded at any time if you are not fully satisfied.

Regular price, 50 cents.
 Sears, Roebuck & Co.'s Catalogue No. 65W510 **39c**
 Price, per bottle

If by mail, postage and packing extra, 10 cents.



DAVIS VETERINARY CARBOLIC SALVE.

CARBOLIC SALVE is too well known to require any extended description. Suffice it to say that Davis Veterinary Carbolic Salve is manufactured only from the purest of **Petrolatum** and **Carbolic Acid**. The proportions are right and it is mixed right, and to those wishing such an article it cannot be too highly recommended. Regular price, 50 cents.

Sears, Roebuck & Co.'s Catalogue No. 65W660 Price, per box..... **39c**

If by mail, postage extra, 18 cents.



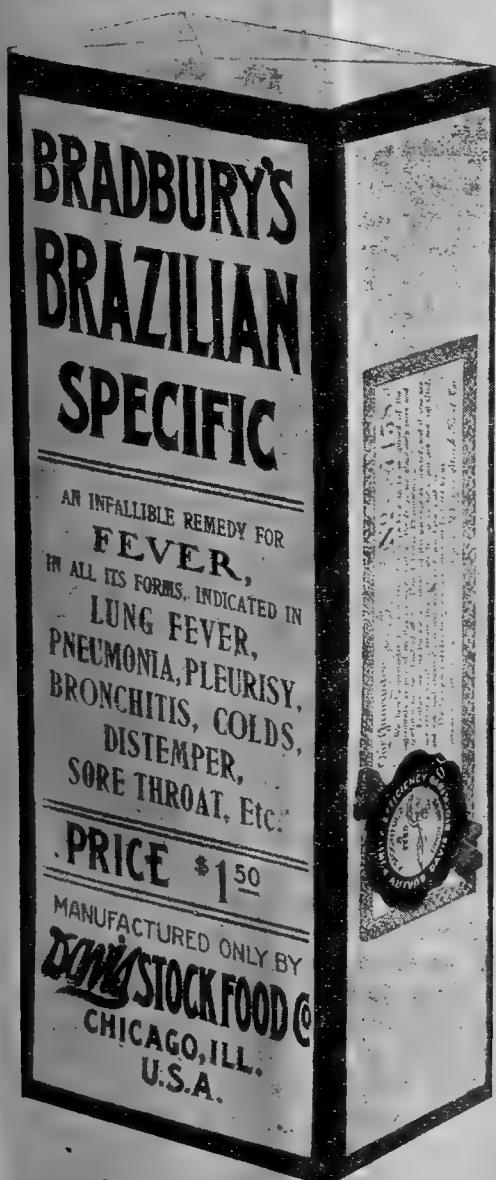
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Bradbury's Brazilian Specific

AN INFALLIBLE REMEDY FOR FEVER IN ALL ITS FORMS,

and especially indicated in Lung Fever, Pneumonia, Pleurisy, Bronchitis, Enteritis, Peritonitis, Sore Throat, Inflammation of the Bowels, etc.



There has long been a need for a reliable, safe and efficient fever remedy for live stock, and in **BRADBURY'S BRAZILIAN SPECIFIC** we believe that we have an ideal preparation. It is composed of the following standard remedies, properly mixed and prepared in our own factory, under the supervision of an expert manufacturing chemist:

F. E. Aconite Rt. is an antipyretic, diaphoretic and diuretic. Its antipyretic action is due to its sedative action upon the heart and respiration. Hence, its use is indicated in acute inflammatory diseases.

F. E. Verat Veride is a powerful antipyretic and is an excellent sedative, particularly in pneumonia, enteritis, rheumatism, nephritis and laminitis.

F. E. Belladonna relieves the pain attendant upon the various inflammations, stimulates the heart; extremely serviceable in the respiratory diseases of the horse.

Potass. Nitrate is a powerful diuretic, febrifuge and alterative. One of the safest and best remedies known and in universal use.

Gin is an antiseptic, antiparasitic, antispasmodic, and antipyretic, especially indicated in weak heart, and to regulate the respiration.

Bradbury's Brazilian Specific is Fully Guaranteed

OR YOUR MONEY WILL BE CHEERFULLY REFUNDED IF IT EVER PROVES UNSATISFACTORY.

It should be kept on hand in all well regulated stables to meet the emergency of such diseases as it is indicated in.

Regular price, per bottle, \$1.50. 89c
 Sears, Roebuck & Co.'s Catalogue No. 65W680 Price, per bottle.
 Unmailable on account of weight.

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 Do not send any orders to us (Davis Stock Food Co.), but address all orders to Sears, Roebuck & Co., Chicago.

KENTUCKY FOOT FORM—THE FINEST HOOF DRESSING MADE.



IN OFFERING THE KENTUCKY FOOT FORM, our famous hoof dressing, to the horse owners of America, we wish

to say that it is not an ordinary dressing, but the result of many years of practice by one of the most notable veterinarians whose practice has long been confined to the care of the highest bred horses on the American turf. To make an ordinary everyday dressing is a comparatively easy task, but to manufacture one like the **KENTUCKY FOOT FORM**, with all its splendid qualities, requires expert knowledge of the hoof, its diseases and method of treatment, to bring about the most satisfactory results, and after many years of experience in the finest studs of the country this hoof dressing, **KENTUCKY FOOT FORM**, was developed and is offered as a dressing containing all the excellent qualities of the best hoof dressing on the market at the present time without their objectionable properties.

FOR PREVENTING TOE CRACKS,

corns, quarter cracks, hard, dry brittle and tender feet, Kentucky Foot Form stands without an equal. These are common everyday troubles which annoy the horse owner and unless properly treated affect the value of the animal, and the use of **KENTUCKY FOOT FORM** hoof dressing will bring about speedy relief and at the same time act as a preventive in the future. It is just as essential that a horse's hoofs be examined occasionally, cleaned and properly treated, as it is that the animal should be curried, brushed and kept clean. A hoof dressing should be used occasionally as a preventive of hoof diseases, and we guarantee that if you use **KENTUCKY FOOT FORM** the hoofs will always be clean, soft, healthy and beautiful. It is abso-

lutely free from fish oils and other similar ingredients; it is compounded from absolutely pure substances, and we guarantee it to be the very highest grade hoof dressing offered at any price.

Regular price, per pint, 75 cents.		
Sears, Roebuck & Co.'s Catalogue No. 65W560	Price, per pint.....	\$0.59
Regular price, per quart, \$1.25.		
Sears, Roebuck & Co.'s Catalogue No. 65W561	Price, per quart.....	.89
Regular price, per gallon, \$4.00.		
Sears, Roebuck & Co.'s Catalogue No. 65W562	Price, per gallon.....	3.29

Unmailable on account of weight.

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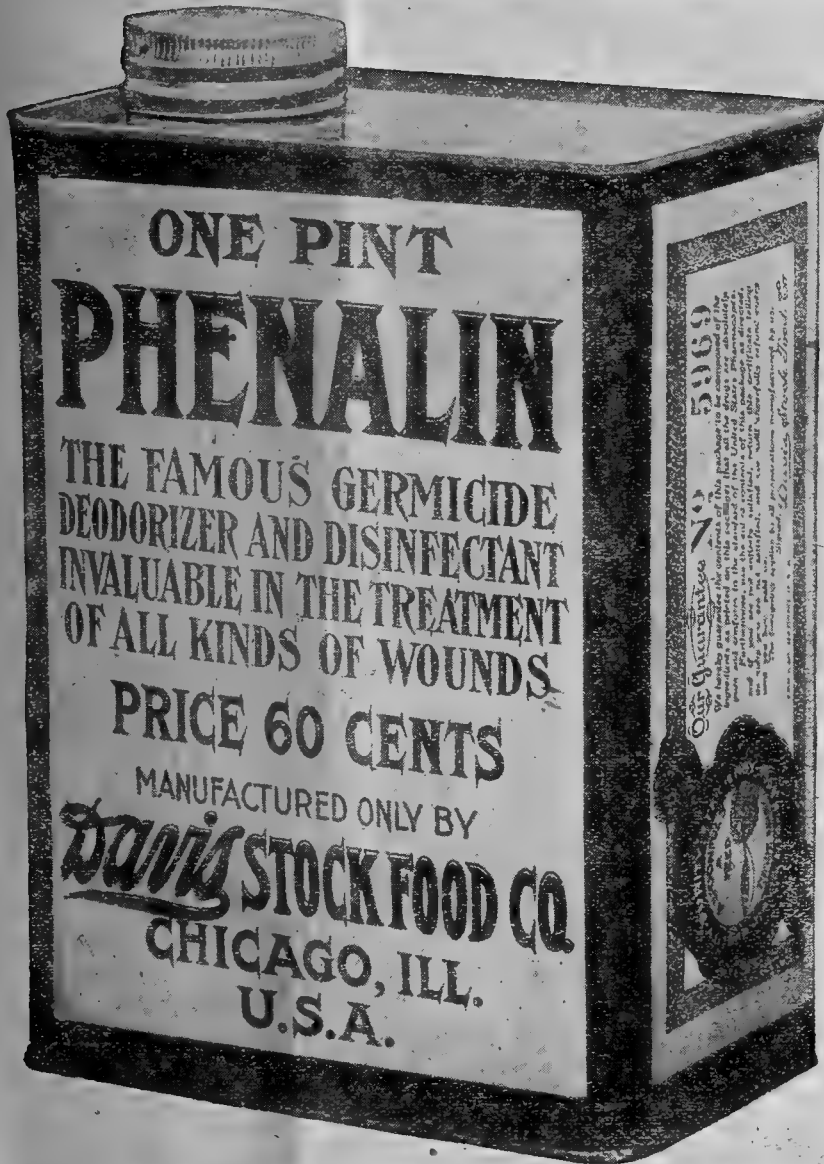
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PHENALIN.

THE IDEAL GERMICIDE, INSECTICIDE, DEODORIZER AND ANTISEPTIC



PERFECTLY HARMLESS to man and the higher forms of animal life, but deadly to germs and insects. Phenalin is the cheapest disinfectant to use because of its strength, as one part of Phenalin to one hundred parts of water makes a solution which is death to every form of germ life. Every stock raiser will find a supply of Phenalin almost a necessity, as its manifold uses and germicidal properties make it indispensable. Its curative and preventive properties make it the most valuable general purpose remedy on the market.

SOME OF ITS USES.

CATTLE. Mange, screw worm, scratches, lice, inflamed udders, inflamed teats, galls, sores and wire cuts, will heal quicker under Phenalin treatment than any other treatment known. Try it, and if you do not find it so, we will cheerfully refund your money. Lice will be entirely unknown on cattle if Phenalin is used.

SHEEP. Phenalin will cure sheep affected with scab, foot rot, grubs in the head, anthrax, ticks, etc. If properly used as a preventive, your flock will not be affected with any of these diseases.

HORSES. Phenalin is the best remedy to use for bad hoofs, nail in the foot, scratches, galls, wire cuts, etc. It will keep flies off affected parts, and will cure with remarkable rapidity.

HOG CHOLERA. This is undoubtedly one of the most destructive diseases which afflicts the stock raising industry. As a preventive, Phenalin is a wonderfully efficacious remedy and its use is an absolute prevention of this dread disease. It is much easier and much cheaper to prevent this disease than it is to attempt to cure it after it has secured a foothold, and a small quantity of Phenalin used in the drinking troughs will keep your hogs in a fine, healthy condition.

CHICKENS can easily be cured of leukemia, pip, scaly legs, canker, cholera, limber neck and chicken pox if the Phenalin treatment is used. Phenalin is also the best lice destroyer and preventive. Where it is used lice cannot live.

DOGS. Phenalin is positively guaranteed to cure mange. Fleas cannot live on dogs that are occasionally washed in water to which a small quantity of Phenalin has been added.

INSECT PESTS ON PLANTS. If plants are occasionally sprayed with a weak solution of Phenalin, such a thing as insects on them will be entirely unknown.

FOR URINALS AND CLOSETS Phenalin is the best disinfectant and deodorizer, as it destroys all disease germs, and kills any bad odors which may be present. Full directions sent with each package. Order a bottle of Phenalin and if it does not do exactly what we claim for it, write us and we will send back your money.

Regular price, per gallon, \$3.00.			
Sears, Roebuck & Co.'s Catalogue No. 65W540	Price, per gallon	.....	\$2.49
Regular price, per 1/2 gallon, \$1.75.			
Sears, Roebuck & Co.'s Catalogue No. 65W541	Price, per 1/2 gallon	.....	1.44
Regular price, per quart, \$1.00.			
Sears, Roebuck & Co.'s Catalogue No. 65W542	Price, per quart	.....	.79
Regular price, per pint, 60 cents.			
Sears, Roebuck & Co.'s Catalogue No. 65W543	Price, per pint49
	Unmailable on account of weight.		

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39¢ DR. FILLMORE'S CHICKOLIN
 THE ONLY SURE CURE FOR CHOLERA AND GAPES IN CHICKENS
 TURKEYS AND GUINEAS.

KEEPS FOWLS HEALTHY, MAKES THEM FEEL BETTER AND LAY BETTER.
 PAYS BIG TO FEED.

DR. FILLMORE'S CHICKOLIN is the only sure cure for cholera and gapes in chickens. It has been in use on prominent poultry farms for years and has demonstrated its value as a wonderful and extremely valuable poultry remedy. In fact, the virtues of this remedy have become so well known that many poultry raisers consider **Chickolin** as essential for raising chickens, curing and preventing diseases, as the housewife considers salt and pepper for seasoning.

CHICKOLIN is an absolute necessity for the successful and profitable raising of poultry. It is equally good for the young chick or the old hen or the rooster. Given as a preventive, it prevents diseases and makes poultry raising profitable. For the curing of cholera, indigestion, bowel complaints, etc., use **Dr. Fillmore's Chickolin** at the rate of one teaspoonful to each gallon of drinking water and remove all other drinking water.

FOR CANKER apply **Chickolin pure** with a small brush or feather after removing the canker. For frosted combs, swelled head, chicken pox, sores, cuts, wounds, sore eyes, etc., apply **Chickolin** at the rate of one teaspoonful to half a pint of water.

IF YOUR CHICKENS ARE AILING, if they droop around the poultry yard, if their plumage is lusterless, you should order **Chickolin** at once and begin its use. It works wonders in any poultry yard, and as a general all purpose remedy it is recommended as the best to be had.

We guarantee **Chickolin** and will refund the purchase price if it isn't satisfactory.

Regular price, per bottle, 50c.

Sears, Roebuck & Co.'s Catalogue No. 65W600. Price, per bottle..... **39c**

Unavailable on account of weight.



DAVIS MANGE CURE.

MANGE is a contagious disease of the skin caused by parasites, which, after burrowing beneath the skin, cause inflammation, watery discharges, which, drying, form unsightly scabs. This troublesome disease may make its appearance almost anywhere on the animal. It spreads very rapidly unless prompt measures are taken to effect a cure. To relieve the intolerable itching accompanying this disease, the animal will either bite the affected parts or rub them against anything with which it comes in contact, removing the hair, and a raw, unsightly sore develops.

IN ORDER TO EFFECT A CURE it is necessary to use a remedy that will not only destroy the parasites and their eggs, but one that will heal the wounds and sores. In **Davis Mange Cure** we have succeeded in producing what we believe to be an ideal remedy for this disease. It has been thoroughly tested and tried.

IF YOU HAVE A VALUABLE DOG, you will find it worth while to keep a bottle of this remedy in your medicine chest. Every bottle of **Davis Mange Cure** is fully guaranteed, and the ingredients of which it is composed are printed in plain letters on every package.

Regular price, per bottle, \$1.00.

Sears, Roebuck & Co.'s Catalogue No. 65W760 Price, per bottle..... **79c**

If by mail, packing and postage extra, 10 cents.

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 Do not send any orders to us (Davis Stock Food Co.), but address all orders to Sears, Roebuck & Co., Chicago.

SILVER SPAVIN CURE.

A CERTAIN REMEDY for all bunches or blemishes on horses. An absorbent and counter irritant. Absolutely guaranteed to cure Bone Spavin that is just developing, Blood Spavin, Bog Spavin, Curb, Splint, Capped Hock, Wind Galls, Soft Blemishes and all forms of enlargement and recent growths of every description.

MANY A VALUABLE HORSE has been rendered practically worthless by the development of a spavin or some other blemish which lames him and practically ends his days of usefulness. No disease is more destructive to the usefulness and value of a horse, and for years it has been a constantly accepted belief that this disease, serious in its inception and more serious in its progress, is an ailment for which there has been no certain cure.

A CERTAIN CURE for this stubborn and heretofore unyielding disease of the horse has been found in **SILVER SPAVIN CURE**, and we offer it to you under our guarantee that it will do all that is claimed for it if the simple directions on the package are followed, or we will cheerfully refund the purchase price. This marvelous remedy is the result of many years of practice by one of the most renowned veterinary surgeons, who gave practically all his time and attention to diseases of the horse and particularly affections of the limbs, for which this remedy is designed. A thorough knowledge of the physiology of the horse, a most careful and searching study of the peculiarities of the several forms of spavin, and the nature of the injuries and diseases causing lameness in horses, resulted in the perfection of **SILVER SPAVIN CURE**, which has never been approached by any remedy ever devised for this purpose. The penetrating and absorbent properties of **SILVER SPAVIN CURE** are really wonderful; its application to the affected parts brings quick relief. Inflammation disappears, the unnatural growth is permanently killed, the circulation of the blood is greatly accelerated, a dissolution of the ossified deposit begins at once, there is immediate improvement, the lameness gradually, but surely wearing off, and a positive and permanent cure results.

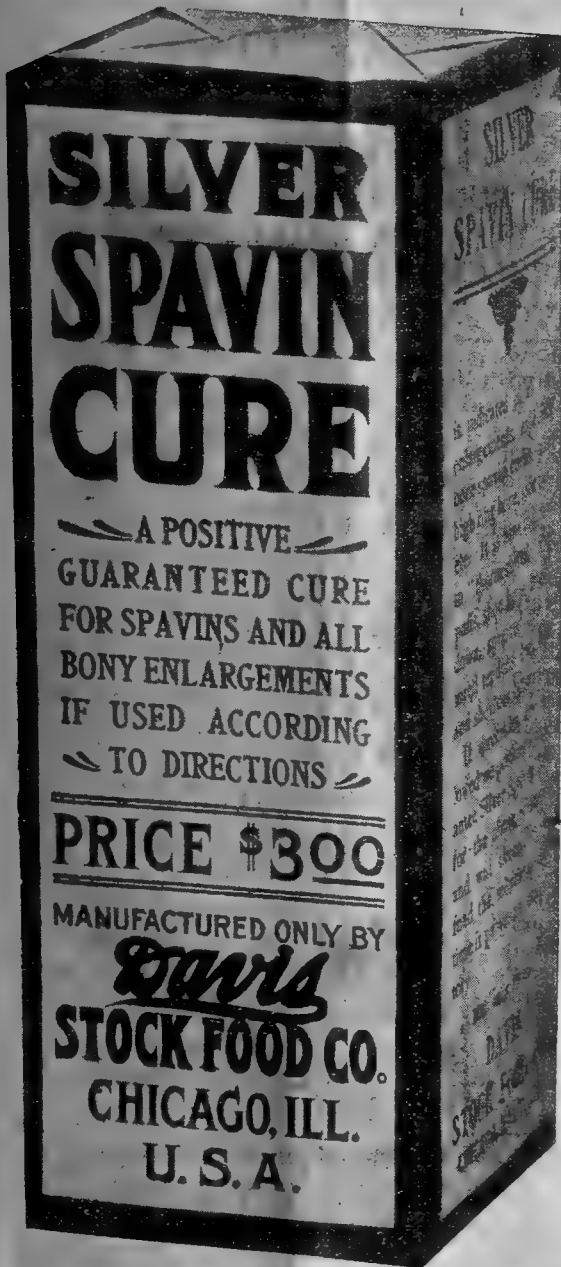
IN ALL CASES OF SPAVIN, in all its several stages, but more particularly in its elementary stage, or when first suspected, **SILVER SPAVIN CURE** does not bring simply temporary relief, but produces a perfect and permanent cure almost at once, and it is so wonderfully efficacious in treating all aggravated forms of spavin, as well as curb, splint, wind galls, etc., that no horse owner can afford to be without a bottle of this splendid remedy for use in an emergency, because severe labor or strains, resulting from heavy pulling or fast driving, frequently develops spavin, ringbone, curb, splint or other affections of this character which, when neglected, develop into the most aggravated cases and in time render the animal practically worthless.

NO MATTER WHAT OTHERS MAY TELL YOU with reference to the treatment of spavin and similar diseases, there is only one way to remove the ossified growth and unnatural bony substance which develops and this is by absorption. The wonderfully penetrating and absorbent properties of **SILVER SPAVIN CURE** make it the only recognized and positive cure for this disease. There seems to be no limit to its curative qualities in the diseases for which we recommend it, and its application according to directions not only brings immediate relief, but its action and its influence upon the tissues seem to continue for months after the treatment ceases. It not only removes the bony growths and restores the affected parts to a natural and healthy condition in most cases, but it seems to correct the unnatural conditions of the blood and circulation to such an extent that the unnatural deposits cease entirely and there is no recurrence of the trouble. However, there are cases in which, because of complications, even **SILVER SPAVIN CURE** cannot dissolve the bony deposits, but in every case it cures the lameness. In some cases the bony deposits are nature's effort to build up a weak joint, and it is not desirable to reduce the deposits, and when the trouble is of long standing and complicated, no remedy can reduce the lump, and only **SILVER SPAVIN CURE** will cure the lameness. We guarantee it to cure the lameness and arrest the progress of the disease. Aside from the fact that the curative qualities of **SILVER SPAVIN CURE** are really marvelous (and it has been known to cure cases that were deemed beyond all possible relief), it is guaranteed to be perfectly safe to use, and it will not destroy the hair follicles, nor will it leave the slightest scar. There are some spavin remedies offered on the market which may and may not relieve a spavin in its early stages, but they are composed of such strong caustics and other drugs that they destroy the hair and skin wherever applied, and leave an unsightly scar.

SILVER SPAVIN CURE, no matter how often or how long applied, will not injure the hair or tissues, and as soon as the treatment is suspended a new growth of hair appears and the limb of the animal is as smooth and glossy as it was before the disease appeared. In fact, it does not leave the slightest evidence of the treatment and the most expert veterinarian could go over the animal very carefully and would fail to discover that the horse had been afflicted with a spavin, a ringbone, splint, curb or any of the diseases which this remedy is guaranteed to cure. **IN OFFERING SILVER SPAVIN CURE** to our customers we are bringing within their reach a remedy heretofore known only to the veterinary profession and long used by the most expert veterinary surgeons in their private practice with unfailing results, and it is brought to you at a price much lower than that asked by many others for remedies which fail to bring relief, and we offer it to you in absolute confidence that it will do all we claim for it or we will cheerfully refund the purchase price.

THERE ARE IMITATIONS OF THIS SPLENDID REMEDY offered by unscrupulous manufacturers and dealers who, realizing the serious nature of this disease and understanding how quickly it renders a valuable horse worthless, hold out many glittering promises to the horse owner, and whose only object is to secure the \$3.00 or \$5.00 price of their remedy, which is little enough to pay for a cure if the remedy they offer would really do all they claim for it. We feel that while we can make the strongest possible claims for **SILVER SPAVIN CURE**, and it has already demonstrated its wonderful curative properties, we should offer this remedy on a guarantee of results, we should give you an opportunity to try it without risk of loss if it fails to cure, and it is for this reason that we say to you that if it fails to do all we claim for it, when the simple and easily understood directions on the bottle are followed, we will cheerfully refund the purchase price. Under these conditions you cannot afford to experiment with any other remedy offered which is claimed to be "just as good" as **SILVER SPAVIN CURE**. There are no "just as good" substitutes.

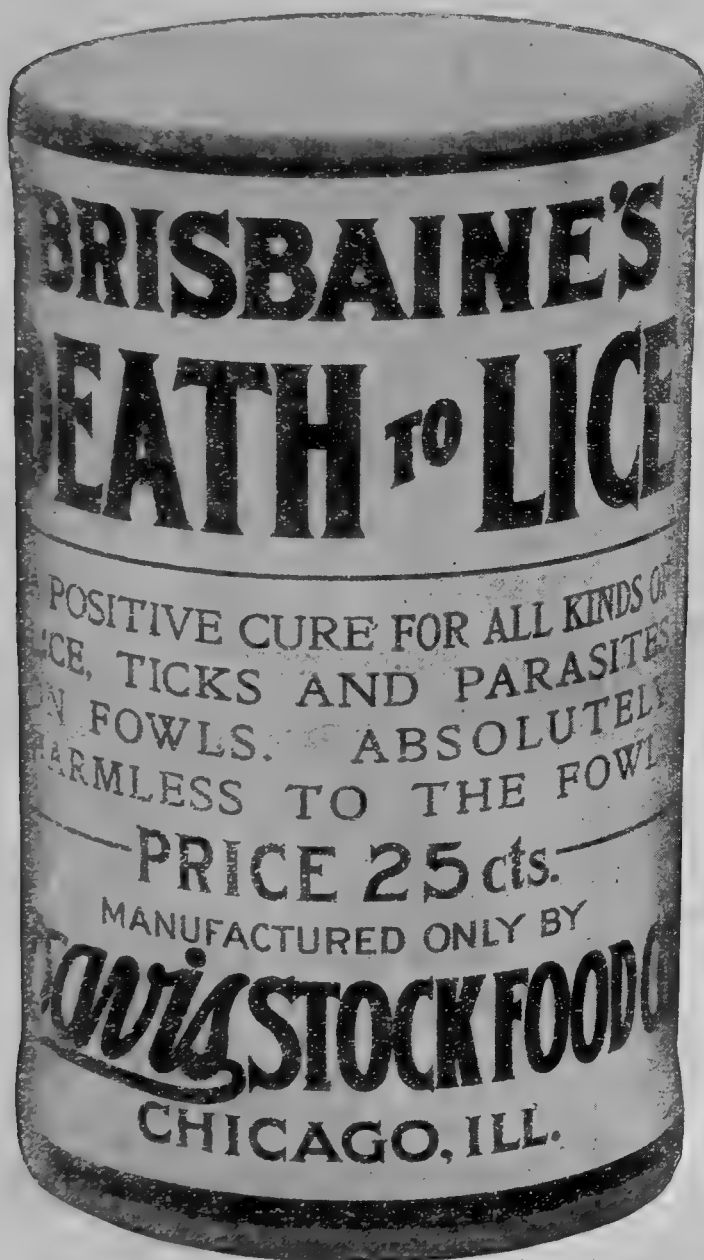
Regular price, per bottle, \$3.00. **\$2.29**
 Sears, Roebuck & Co.'s Catalogue No. 65 W530 Price, per bottle
 If by mail, postage and packing extra, 10 cents.



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Do not send any orders to us (Davis Stock Food Co.), but address all orders to Sears, Roebuck & Co., Chicago.



BRISBAINE'S DEATH TO LICE.

THE ONE SURE CURE FOR LICE ON FOWLS. A
POWERFUL LOUSE KILLER BUT
HARMLESS TO POULTRY.

IF YOU HAVE EVER RAISED POULTRY

you undoubtedly have had your share of trouble in having your birds pestered with lice. Wherever chickens are raised lice are bred, and lice and chickens make a poor combination. If your birds must waste their time and energy providing nourishment for myriads of lice and parasites, you cannot expect them to lay on flesh and keep your table supplied with eggs; therefore, do not wait until they become infested with lice before treating them. Obtain a good louse powder and see that it is used occasionally. Prevention is ever better than a cure. There are so many different varieties of lice infesting chickens that it would be impossible to attempt to name them in our limited space. There is one, however, that is so generally distributed that it is worthy of a more than passing mention, namely, the "Chicken Mite," technically known as the *Dermanyssus gallina*. Wherever chickens are raised, there this mite is found. Its normal color is light gray with dark spots, but when filled with blood it takes on a decidedly red appearance. Its usual habit is to attack the birds at night and to hide in the cracks and corners of the roosts and rubbish during the day, but in exceptionally bad attacks the mite remains on the fowls during daytime. As a rule, however, it makes its appearance late at night. For this reason the chicken mite is decidedly dangerous to profitable poultry raising. Often, upon an examination of the fowls during the day, you will fail to find the parasite, although the fowls are badly infested at night. Occasionally this mite infests man, horses and other animals, producing symptoms of scab by its bite.

IN ORDER TO SUCCESSFULLY COMBAT AND DESTROY THIS PARASITE,

it is necessary to thoroughly spray the walls, all the cracks, the roosts, the rubbish, the droppings and bedding of the house, and to occasionally dust the fowls with Brisbaine's Death to Lice. Brisbaine's Death to Lice is a thoroughly efficient louse killer. It is absolutely harmless to the fowl, and in this feature is radically different from a number of the so called louse killers

now on the market. The articles of which it is composed are printed in plain letters on every package, something that you should insist upon in everything you buy. Many poultry raisers have had a discouraging experience in buying louse killers, and, after having used them, faithfully following directions, only to go out some morning and find half their chickens dead. The only sure protection against this is to force the manufacturer to print his ingredients on the label of the package, so that you may know what you are using. If his article is a harmless and efficient one, he should have no objection to doing it, and if he refuses to do so you may draw your own conclusions. We know what Brisbaine's Death to Lice is. You may know when you purchase a package. We know that it is harmless and efficient. You can easily determine this by giving it a trial. It is put up for your convenience in a strong round box, with sprinkling top attached, so that you need not remove the lid to use the powder, it being made like a sifter. When you next send us an order, include an order for one package of Brisbaine's Death to Lice. It will pay for itself many times over. It is put up in strong one-pound sprinkler top cartons, 25 cents each. Your money back if not entirely satisfied.

Regular price, per box, 25 cents.

Sears, Roebuck & Co.'s Catalogue No. 65W630 Price, per box.....

If by mail, postage extra, 16 cents.

19c

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DAVIS WIRE CUT REMEDY.

HEALS ALL WIRE CUTS—LEAVES NO SCARS.

THOUSANDS OF VALUABLE HORSES, cattle and other animals are fences, and in many cases are permanently crippled or disfigured because the injury is not properly treated. In Davis Wire Cut Remedy we offer the very best treatment for cuts from barbed wire, as well as all other flesh wounds, and as a healing, cleansing, antiseptic and disinfecting agent it is soothing and mild in action and positive in results.

THIS SPLENDID HEALING LOTION demonstrates its virtue in the quick, easy and thorough healing of all scratches, barbed wire or other cuts, lacerations or deep incisions. Its ingredients are harmless, and while it is prepared especially for use in treating animals, it is equally satisfactory as a healing remedy for both man and beast. If Davis Wire Cut Remedy is used promptly in all cases according to directions on the bottle it is absolutely impossible for blood poisoning to result; its antiseptic properties quickly kill all germs, inflammation is immediately allayed, suppuration is prevented, and the daily application of the lotion promotes the rebuilding of the injured tissues and a prompt and permanent cure results. No remedy offered stock raisers is of greater value than this, our Davis Wire Cut Remedy, and it ought to be in the veterinary medicine chest of every stock raiser for use in emergencies.

Regular price, \$1.00.
 Sears, Roebuck & Co.'s Catalogue No. 65W700 Price, per bottle **79c**
 Unmailable on account of weight.

DAVIS COLIC CURE.

UNSURPASSED FOR ALL STOMACH AND BOWEL TROUBLES. YOUR MONEY BACK IF IT EVER FAILS TO CURE.

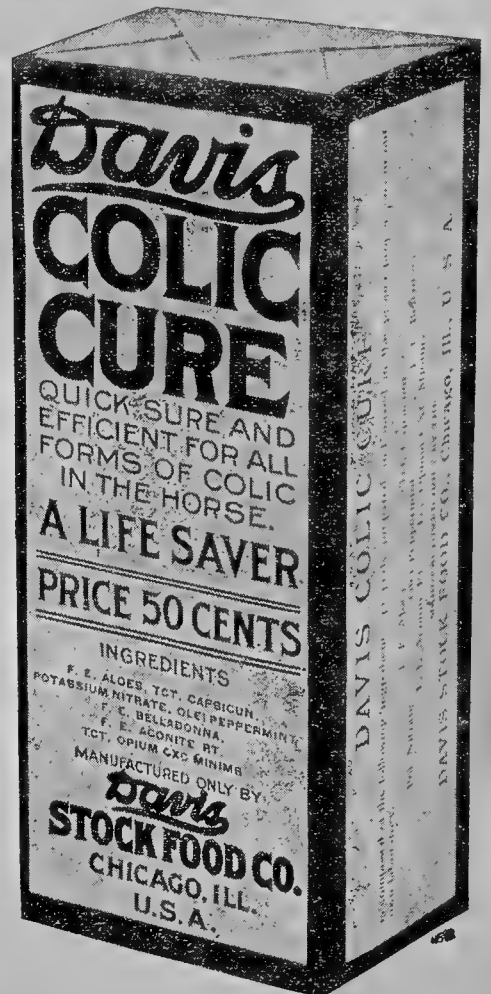
A REMEDY THAT EVERY STOCK OWNER SHOULD

POSSESS. Colic is the most distressing of all troubles of animals, and more horses die every year of it than from all noncontagious diseases combined. Colic is a spasmodic contraction of the

muscular coat of any part of the intestines, usually caused by improper feeding. The animal affected with it will appear uneasy, pawing the ground, arching the back, looking around at the flank. On lying down he will kick at his belly and roll on the ground until the spasms are relieved. In all such cases Davis Colic Cure will bring quick and certain relief, and the stock raisers who have tried it are enthusiastic in praise of it. One dose usually cures the most severe case of colic in horses and cattle, and we have never known a case where a second dose failed.

IS YOUR HORSE WORTH 50c? Colic comes unexpectedly, it is of frequent occurrence and it is always dangerous. By having this reliable remedy near at hand you run no risk of losing your horse; without it he may die. Davis Colic Cure is cheap insurance, as it cannot fail. Davis Colic Cure is unexcelled for all bowel and stomach troubles accompanied by colic pains, spasmodic or wind colic, cramps, bloats, engorgement of stomach, stoppage of water, indigestion, etc. It relieves the pain and relaxes the muscular coat of the stomach, bowels, and bladder, stopping fermentation and causing a normal action and free evacuation of the organs. It acts instantly, is easily administered, and is a sure cure where other remedies fail. Full directions are given upon each bottle, together with information as to the best and quickest means of relieving the animal when attacks come on.

Regular price, per bottle, 50 cents.
 Sears, Roebuck & Co.'s Catalogue No. 65W740 Price, per bottle **39c**
 Unmailable on account of weight.



THE VETERINARY REMEDIES SHOWN IN THESE PAGES
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DAVIS FLY CHASER.

A GREAT MONEY SAVER AND PROFIT PRODUCER FOR STOCKMEN.



FLIES COST THE STOCK RAISERS of the United States more than half a billion dollars annually.

This is a strong statement to make, but the Bureau of Animal Industry of the Agricultural Department of the Government has discovered that this is a conservative estimate of what is represented as lost from shrinkage of milk production and flesh, due to the misery inflicted on live stock by flies, mosquitoes, ticks, and other insect pests, which torment them from four to six months during the year.

WE OFFER DAVIS FLY CHASER as a very effective remedy against flies, mosquitoes and all other insect pests, the most satisfactory remedy on the market, one which is easily applied, and while it is very effective for the purpose for which it is designed, it is absolutely harmless to both man and beast.

IT IS FALSE ECONOMY to feed a horse from twelve to fifteen quarts of oats a day and then have him spend 80 per cent of his energy to keep off a horde of annoying pests in the form of flies and mosquitoes; it lessens his vitality, he is not nearly so good a work horse, he is not

nearly so good a roadster. It is also false economy to turn your milch cows and other cattle loose in the pasture to spend more than half of their time and energy in driving away insect pests, instead of grazing and earning profit for their owner.

IF YOU ARE A DAIRYMAN we heartily recommend the use of Davis Fly Chaser as a method of increasing the product of your dairy; your cows will secrete much more and much better milk, and indeed it has been found from exhaustive tests that a cow treated with Davis Fly Chaser will yield one-third more milk than when she is allowed to graze unprotected from the insects which torment her from four to six months of the year; and cattle which are being fattened for market, which have been turned out to graze that they might be in better condition to go into the feed lot will grow fatter, will take on more flesh, if you use this high class remedy from day to day throughout your herds.

THE LOW COST OF DAVIS FLY CHASER will enable you to treat all your animals at a very great profit, less than half a cent a day per animal will give them absolute immunity from insects of every character. A gallon of fly chaser will make twenty-five gallons of fluid, and it is easily applied with a spraying machine to those animals to be turned out in the pasture or worked in the fields. Spraying the stalls and interior of a barn or cowshed will keep out the insects when the animals are kept indoors.

FLIES SPREAD DISEASE. In fact a large per cent of the mortality among live stock in the summer season is due entirely to contagion carried by flies, and as Davis Fly Chaser is an insecticide, germicide, antiseptic, and disinfectant, it prevents anthrax, Texas fever, and many other diseases of similar nature. No stock raiser can afford to be without this splendid remedy, and we are so sure of its effectiveness, we are so certain that its results will be entirely satisfactory to you, that we guarantee it to be absolutely the very best fly chaser on the market, and if you do not find that it does all we claim for it, we will cheerfully refund your money and pay the transportation charges.

ORDER A SAMPLE CAN of this remedy and use it on your horses, cattle, hogs, dogs, and other domestic animals, and we know that a brief trial will convince you of its splendid qualities and great value to you.

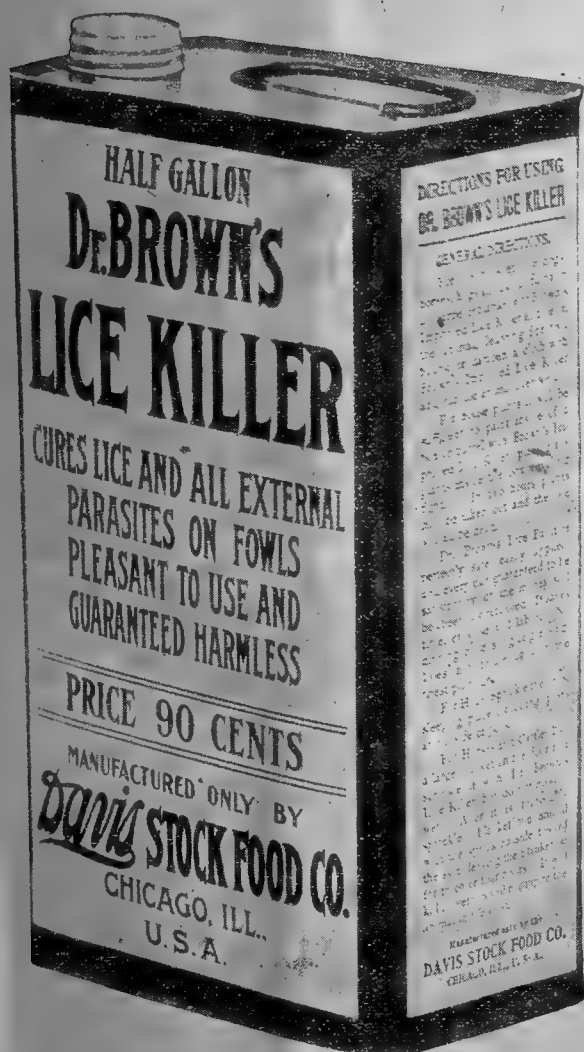
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BROWN'S LICE KILLER, 69^C

A Never Failing Friend to Poultry.

YOUR MONEY CHEERFULLY REFUNDED IF IT EVER FAILS.



BROWN'S LIQUID LICE KILLER is a liquid compounded for the use of the poultry raiser for the destruction of all vermin and the cure of all germ-diseases of fowls. It is not one of those nostrums made as cheap as possible and put upon the market to sell, but an article of unquestioned merit upon which an enormous trade has been built purely through the satisfactory results obtained. It today enjoys the largest sale of any liquid lice killer known.

POULTRY cannot flourish while infested with annoying parasites, and it is seldom that fowls are found without them. BROWN'S LICE KILLER is a certain cure. It will quickly and effectively rid your poultry and poultry houses of lice and mites. All that you have to do is to paint the roosts, nests and other places where the lice harbor. They are quickly killed by the fumes and the hens being free from the pests will commence laying, and egg yield will soon be increased 25 to 50 per cent. When eggs command the high prices of present markets, it certainly pays to encourage the largest possible yield and BROWN'S LICE KILLER will put many dollars in the farmer's pocket.

NO AMOUNT OF ARGUMENT can convince you so thoroughly of the great value of this lice killer like one single trial. Thousands of gallons sold last year and the good results obtained are sufficient proof for the most skeptical.

WE POSITIVELY GUARANTEE BROWN'S LICE KILLER as represented or your money cheerfully refunded. Order a can and judge its value.

Regular price, per 1/2-gallon can, 90 cents.
 Sears, Roebuck & Co.'s Catalogue No. 65W500
 Regular price, per 1-gallon can, \$1.50.
 Sears, Roebuck & Co.'s Catalogue No. 65W501

Price, per 1/2-gallon can **69c**
 Price, per 1-gallon can **92c**

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THE MARTIN HORSE CLIPPING MACHINE \$12.00

THE SIMPLEST, THE EASIEST
RUNNING AND THE
BEST CLIPPER.

\$12.00

AT \$12.00 we offer you our famous Martin Horse Clipping Machine, all complete as shown in the illustration, ready to attach to a post or board in your stable, and at this price it is really the most wonderful value ever offered in a clipping machine. No other clipping device compares with the Martin in simplicity of parts, in easy running, in perfection of work, in lowness of price and we send it out under our unqualified guarantee that it will give absolute satisfaction to every user, that it is in every way the very best clipping machine on the market, and if it is not all that we represent it to be or all that you could ask in a clipping machine, it may be returned to us at our expense and we will promptly refund the purchase price.

EVERY HORSE OWNER, every farmer who works his horses hard and long during the busy season on the farm, every team owner whose horses toil through the long hot days of the summer time, every livey owner who desires to keep his animals in the very pink of condition in short, everyone who has a horse, should own one of these Martin Clipping Machines, and at our astonishingly low price of \$12.00 you have the opportunity to secure a clipper which does absolutely perfect work under all conditions, and which will give you the utmost satisfaction.

ALL THE LEADING AUTHORITIES ON LIVE STOCK now agree that the clipping of horses is decidedly beneficial to the animal. Experiments and careful observation have established the fact that clipping is quite as essential to the welfare of the horse as shoeing him or giving him a comfortable place to sleep at night, and when the reasons for this belief are stated they appeal to the common sense of every horse owner.

A CLIPPED HORSE dries out rapidly after a hard day's work and he refreshed on the following day than he would be if he were permitted to stand or lie in a stable through the cool nights of spring in a thick coat of hair wet and soggy with perspiration.

MANY OF THE DISEASES to which the horse is subject, and he falls a prey to many, are due to his working hard and perspiring freely, and afterward standing or lying in a stable at night in his wet, shaggy coat of hair and catching cold. From a simple cold it is but a step to heaves, pneumonia, rheumatism, distemper and various other kindred troubles, and this danger of disease is always present in the early spring when the animal comes out of a season of long inactivity and he is consequently unhardened to exercise or hard work and is what is commonly called "soft." Under these conditions when he is taken from the stall and begins his spring and summer work he perspires freely. The moisture is held by his long coat of hair, and as he stands in the stable at night, wet and cold, the food that should go to build up the tissues of his body is used instead to develop heat to evaporate the cold perspiration and overcome the chill resulting from his exposure. No horse can be healthy under these conditions.

ON THE OTHER HAND, if before this horse is taken thoroughly clipped with our Martin Clipping Machine, when he goes into the stable at night his coat will be dry in a few minutes, in fact, the perspiration dries almost as soon as it is secreted. He is not covered with a wet, cold blanket of hair and he therefore rests comfortably. He assimilates his food and under these conditions he is in every way a better horse, a stronger horse and at all times he is practically free from disease, especially those diseases which follow severe colds. He will be a more economical horse for you to keep because he will require less food to remain in condition. He will be a much handsomer and a much better horse from every standpoint and worth very much more money in any market.

IF YOU OWN ONE HORSE it will pay you to purchase a Martin Horse Clipping Machine. Keep the animal clipped in the summer more satisfactory service, and you will undoubtedly save the price of the machine after a few short months, because he will eat less, he will do more and better work and his freedom from colds and similar diseases will mean freedom from the services of the veterinary surgeon and the entire absence of bills for veterinary remedies.

IF YOU OWN MORE THAN ONE HORSE, if you have several teams, you cannot afford to be without one of these superior Horse Clipping Machines, works better, the amount represented in the purchase price of this machine is certainly very insignificant when compared to the returns this investment will yield you from day to day. If it will save the horses from one day's sickness now and then, it will quickly pay for itself and if you have never used a horse clipping machine, if you have never had any experience along this line and you own several horses, we urge you wholly in your interest to order one of our Martin Horse Clipping Machines at our \$12.95 price, and on our free trial plan and refund proposition, as explained further on this page, and we know that a brief experience will convince you that it is just as necessary in your stable as your investment in harness, in wagons, in buggies or in any other equipment you find absolutely essential as a horse owner.

FROM THE STANDPOINT OF ECONOMY, therefore, and leaving out of the question the matter of appearance, it will pay you immensely to order one of these perfect horse clipping machines at our \$12.95 price. It saves the horse, it prevents disease and consequent idleness of the animal, it saves horse feed. It requires very little saving along any one of the lines mentioned to quickly return the purchase price. No matter what your experience may have been with other machines, no matter if you have tried other horse clipping machines and they have proven unsatisfactory, we want you to send us an order for this wonderful machine. We send it to you on the broadest sort of a guarantee so that if it isn't perfectly satisfactory it comes back to us and your money will be refunded and you will not be out one cent on the transaction. If we were not absolutely sure of the high quality of this machine, if we were not absolutely certain that it is the best clipping machine on the market and is in every way all that we represent it to be we could not afford to send it to you on such broad and liberal terms, but there are many thousands of them in use; they are giving such universal satisfaction in all cases that we have no hesitation in recommending the Martin Clipping Machine to you as the very acme of perfection in a horse clipping machine.

OUR WONDERFULLY LIBERAL TERMS.

SEND US \$12.00 for this machine all ready to attach to a post or board, or send us \$12.95 for the machine complete with iron stand as shown in the larger illustration. When it has arrived and is connected up, clip your horses with it and after you have tried it on all of them, if you are not perfectly satisfied that it is a wonderful value, that it is as fine a clipping machine as you could get from anyone at any price, if you are not fully satisfied to keep the machine you may return it to us at our expense of transportation charges both ways and we will promptly refund your money. If you have any doubt of the quality of the machine as compared to any other horse clipping machine on the market, we would be pleased to have you order any other horse clipping machine that you think compares favorably with ours, at the same time you send us for the Martin and we will be glad to have you try them side by side, to compare them from every standpoint; from the standpoint of simplicity, of easy running, of perfect clipping without grinding or pulling, and if you do not decide after making this test yourself in your own way that our machine is by far the better of the two, you may return it to us at our expense and we will refund the purchase price.

OUR BINDING GUARANTEE.

The Martin Horse Clipping Machine is made by us in our own factory and we control the patents under which it is manufactured. We own the special machinery used in its construction; we know the quality of every piece of material which enters into it and we employ skilled workmen to build it. The materials used in its construction are the very best that money can buy, all the working parts are very carefully fitted and we guarantee this machine against defective materials or workmanship for a period of 20 years, and if any piece or part gives out or breaks by reason of defective material or workmanship within that period, we will promptly replace such defective piece or part absolutely free of charge.

This guarantee, however, does not cover the comb or cutting knife, because they are tempered very hard to give perfect cutting surface and the careless handling of the machine, such as dropping on the floor, is liable to break these delicate parts. Our guarantee, therefore, does not cover these two pieces. We guarantee the Martin Clipping Machine to be better made, to carry better material, to do better work, to wear longer than any other clipping machine on the market, and we send it out to you under this the strongest guarantee covering the longest period of time offered by any manufacturer.

DESCRIPTION OF THE MARTIN HORSE CLIPPER.

THE FRAME is very substantially constructed and the material used is the best gray iron. It is well painted to preserve it from rust, it is very strong and of graceful design. **THE BEARINGS** are of the best cold rolled steel, case hardened. They are accurately milled and equipped with proper oil holes. **THE COMBINATION DRIVE AND BALANCE WHEEL** weighs 20 pounds, it is accurately turned on a lathe to insure its running true and it is fitted with handle. **THE SMALLER GEARS** are made of the best cold rolled steel, case hardened. The flexible shaft is made of cold rolled steel links especially designed for use in this machine. **Casting covering** of flexible shaft is of best woven fabric. **ALL GEARS** are properly protected so that the operator is in no danger from accidental catching of the clothing or person in the mesh. **THE HEAD** is the vital part of this machine and it is illustrated herewith. The comb is very carefully milled with teeth close together and it is adjustable to the cutter knife. The teeth are open and short, properly beveled and will not clog. The machine eats its own way through the hair without hard pushing on the part of the operator; just the gentlest pressure will keep it moving rapidly. The cutting blade which vibrates back and forth over the teeth of the comb is speeded to about 1,600 vibrations to the minute and possesses a cutting power excelling any other cutter head ever devised. It clips very rapidly and there is practically no limit to the speed of this machine as it will clip as rapidly as the experience of the operator will permit. Because of the short, blunt comb and protected cutting knife, it is absolutely impossible to cut the animal by accident. The cutter lever is made of Manganese Bronze, hung on perfect bearings and it is practically everlasting. The comb and knives are made of a special high grade cold rolled tool steel especially hardened and tempered for use in these machines. The cutter knife is easily inserted or removed and a small thumb screw on the cutter lever regulates the tension of the cutting knife, and as the blade grows dull a slight turn of this thumb screw presents a new cutting surface. This cutting head has an absolute shear cut. It doesn't grind off the hair as many other machines do, but cuts it clean and smooth and it doesn't pull. It is no trick at all to remove the dull cutter blades and insert sharpened blades. All the working parts in the head are made of the best cold rolled steel, case hardened and are enclosed in a malleable cast handle, heavily nickel plated.

No. 10G4890 Martin Horse Clipping Machine, ready to fasten to post or board, complete with four cutting blades. Weight, 65 pounds. Price \$12.00
No. 10G4892 Martin Horse Clipping Machine, complete with iron stand and four cutting blades. Price \$12.95
Extra Cutting Blades, each.....
Extra Combs, each.....

WE WILL EXCHANGE one sharp blade for every two dull cutting blades sent us or we will sharpen dull blades free of charge provided you pay postage both ways.

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WE DON'T KNOW HOW WE CAN MORE FORCEFULLY CONVEY TO YOU OUR CONFIDENCE IN THE SUPERIOR QUALITIES OF THIS MACHINE THAN TO SAY YOU CAN TRY IT AT OUR EXPENSE.



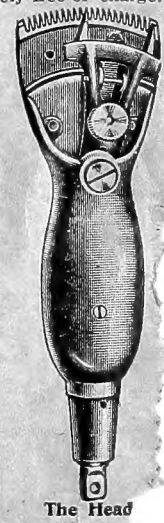
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No. 10G4892
\$12.95

is our price for the MARTIN HORSE CLIPPING MACHINE complete with iron stand as shown in this illustration.



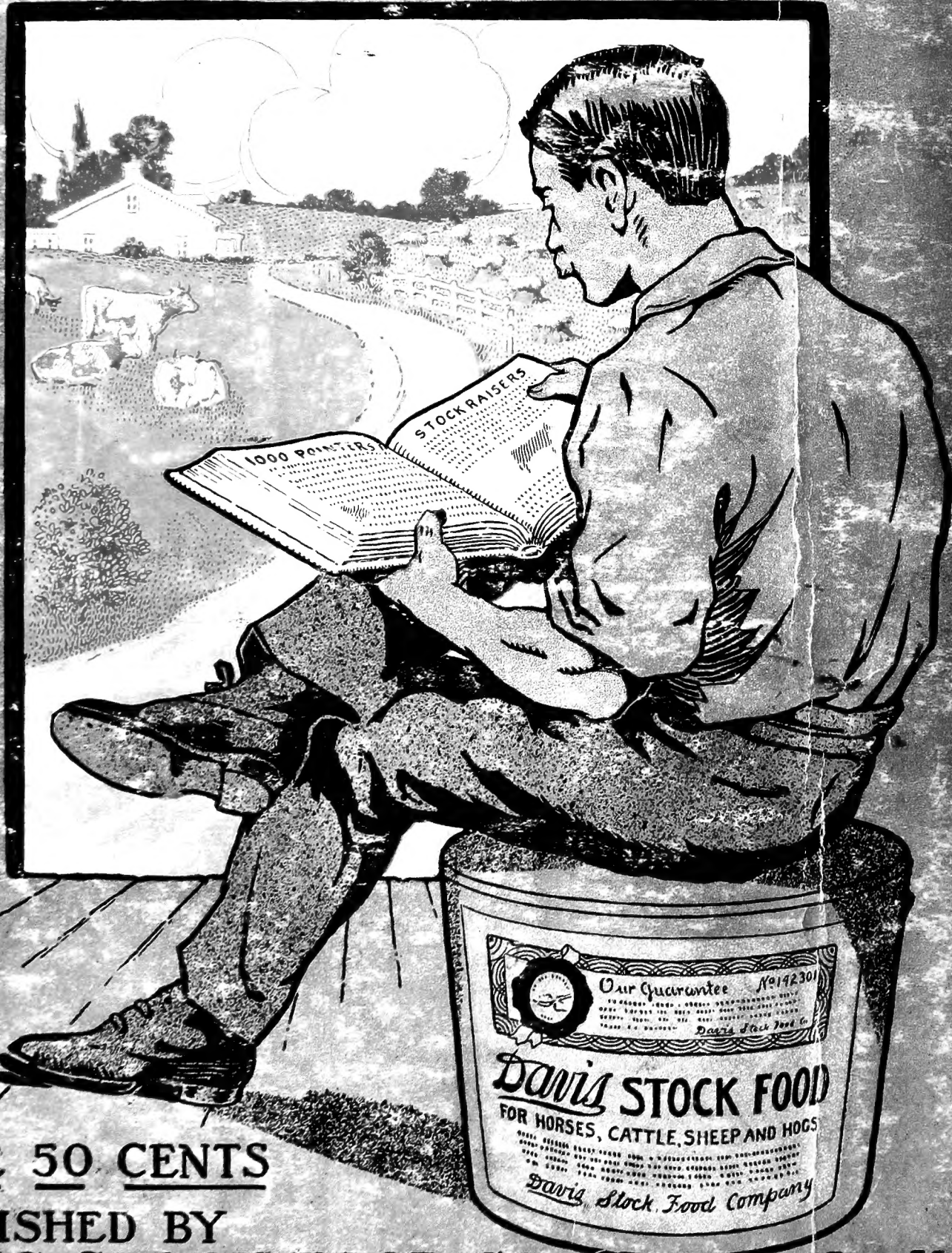
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