

The FARMER'S ENCYCLOPEDIA

POCKET EDITION



Still Alive and Still Champion

FROM "THE FARMER'S VOICE" FOR JANUARY, 1906.



The famous racer "Jay Eye See" as he is today.

There are few owners and lovers of horse flesh familiar with racing records of the past decade, who would need to be told, even with the above picture removed, what the cabalistic "Jay Eye See" stands for. This spelling out of the initials of a great manufacturer of the last generation was once a name to conjure with; and even yet it is widely known as the appellation of one of the most remarkable little horses that ever trod the turf. But there are very few people indeed, outside of those living in Racine, Wis., who know, and who will not be greatly surprised to know, that this famous little horse is still alive. That, however, is the fact, vouched for not only by divers and sundry reputable persons, but by the camera—that cannot lie as well. The photograph which accompanies this article was taken last summer. It shows that Jay Eye See is not only in existence, but very much alive, and still handsome enough for any gentlemen to drive—if he were allowed the privilege.

For no harness is ever put on Jay Eye See's back. His is a horse's paradise. Nothing is required of him but that he live and enjoy himself. This is an unusual distinction even for a blooded horse, and the steps by which Jay Eye See has attained it are interesting.

He came to Mr. J. I. Case as a colt in 1878—was one of a bunch of horses purchased by that gentleman in Kentucky, the lot also including Phallas, the trotting stallion. Jay Eye See, therefore, at the present writing, is 28 years old. It used to be told of him by his trainer, Ed. Bither, that Jay Eye See was about the awkwardest horse he ever struck, and the hardest to break in. It required great perseverance to get him to trot at all, and Bither has said that he came near giving up the job many times before the horse finally began to show form in 1883. In that year he was entered in several races and made good showings. The next year, 1884, at Providence, R. I., he made his famous record of 2:10 to an old style high-wheeled sulky, the best mile that had been trotted up to that time.

There are two curious things about that record. The first is, that it scarcely became 24 hours old—Maud S. lowered it next day. The second is, that as a part of Jay Eye See's right in his title, *it still stands*. For Jay Eye See, notwithstanding he never again raced in competition, is still the champion combination trotter and pacer of the world.

It was eight years after the Providence performance, in 1892, when Mr. Case's son Jackson conceived the idea of teaching Jay Eye See to pace. The hobbles were accordingly brought out and the little horse was hooked up. But the hobbles worried and fretted him so that Mr. Case ordered them taken off before a quarter of a mile had been covered. Then came the surprise. When Mr. Case got back into the sulky, Jay Eye See immediately began to pace—and he was a pacer ever after.

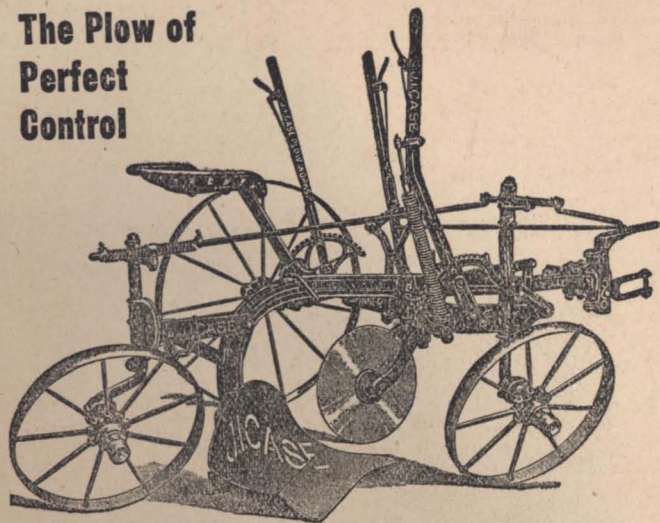
That is what he wanted to be in the beginning—he was a natural born pacer, and that is why his trainers had such a hard time getting him to trot. There is no telling what records might have come Jay Eye See's way, if only he had been allowed to pick his own gait sooner. In 1893, with only one sound leg under him, he went against time at Independence, Iowa, and paced the mile in 2:06 $\frac{1}{4}$. This gave him the title previously referred to and he still holds it. Horses have since trotted faster than 2:10 and others have paced faster than 2:06 $\frac{1}{4}$, but no one horse has ever done both.

There are a great many horse owners who have no compunctions whatever about selling an animal as soon as it ceases to be a big money maker; J. I. Case, Sr., however, was not that type of man. At one time he was offered \$50,000 for Jay Eye See, but he would not even consider it. His horses were something more to him than mere financial investments—he loved them for their own sakes. Jay Eye See remained his owner's favorite when his racing days were over as he had been before, and Mr. Case never ceased to find pleasure in his ownership of the little horse. Since the death of his son, Jackson Case, Jay Eye See has never been harnessed.

Jay Eye See is held in trust by the J. I. Case Plow Works, of Racine, Wis., which is owned and controlled by Mr. H. M. Wallis, the president of the Company, and the heirs of J. I. Case, Mr. Wallis is a son-in-law of the original J. I. Case, and to him we are indebted for the above interesting particulars.

"And," says Mr. Wallis. "Jay Eye See was not the only record-breaker J. I. Case gave his name to. He also founded a factory for the purpose of making record-breaking farm implements—and we are still making them today, under the same name and in the same factory.

The Plow of Perfect Control



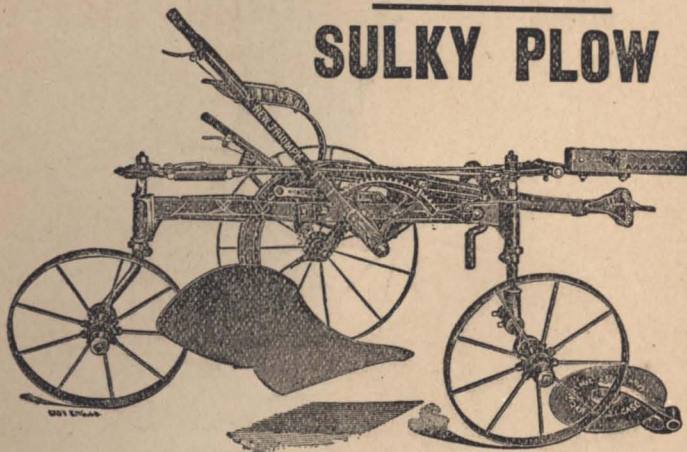
THE J. I. CASE NEW SPINNER SULKY

Is a tongueless plow that plows straight and plows right under every kind of condition and with every kind of team. It has a unique and original hitch in connection with a landing lever which gives you absolute control of the landing of your plow at all times. If the team happens to crowd one way or the other, a slight movement of the lever affects a change of draft and holds the plow to its work, maintaining a straight and uniform furrow. In throwing dirt uphill, this landing lever prevents the bottom from running in too far. In throwing dirt down hill, it holds the plow to its work, without having to continually guide the team, and it gives perfect control for width of cut at all times as stated.

But these are not all of the important points of superiority of the Spinner Sulky by any means. Ask your nearest J. I. C. dealer about the rest of them, or write direct to us for catalogue.

J. I. CASE PLOW WORKS, Racine, Wis.

J. I. CASE TRIUMPH SULKY PLOW



THE FARMER'S FAVORITE.

The J. I. Case Triumph is the farmer's favorite because it is the lightest draft Sulky Plow ever invented. This has been repeatedly demonstrated and proven in fields all over this country. It is accomplished by the adjustment provided for carrying the bottom in such a position in the ground as to carry the rear of the landside up from the bottom of the furrow and away from the furrow bank. This adjustment is an exclusive J. I. Case feature.

That feature, together with the fact that both furrow wheels are always under control of the pole by means of a spring connection, so that the plow is handled just like a wagon, makes it exceedingly light on the horses.

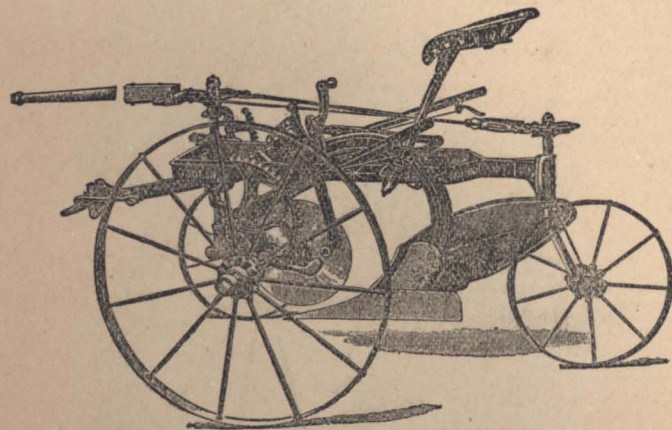
The Triumph is also easy on the driver, because **only one motion of one lever** is necessary to raise or lower the bottom and **at the same time level the frame**. The J. I. Case Triumph therefore is a labor saver for both man and horse.

Another important point to remember is that the Triumph enters the ground **point first and heel up**, and it comes out **point first and heel down**—just like a walking plow. And when the plow bottom is in the ground, it will stay in and plow ground so hard that no other make of moldboard plow can handle it successfully. The real test for a sulky plow is when the ground is so hard that a walking plow cannot be used—then watch the J. I. Case Triumph. You will find it does the work when the other much boasted hard ground sulkies are in the shed with the walking plows. Mark well our claim—the J. I. Case Triumph will plow **hard ground**.

Let us tell you more about it. Ask for our printed matter.

J. I. CASE PLOW WORKS, Racine, Wis.

J. I. CASE SELF-LEVELING HIGH FOOT-LIFT SULKY PLOW



What is accomplished in the Triumph Sulky Plow with one motion of one hand lever, is accomplished in the J. I. Case Self-Leveling High Foot Lift Sulky Plow with one motion of the Foot Lever, viz: **it raises or lowers the bottom and levels the frame with one operation.**

And, remember, it raises the bottom clear up into the frame—six inches above the ground. Other foot lift plows lift the bottom independently of the frame (and then only two or three inches above the ground) which makes it necessary to manipulate one or more hand levers in addition to the foot lever in order to raise the bottom six inches and level the frame, and this has to be done at the end of each furrow, making it tiresome for the operator. In the J. I. Case the operation is more simple and easier. The plow bottom is lifted from plowing position six or more inches in the ground to full six inches out of the ground by one movement of the foot lever, and more—is leveled by the same movement. Hence in the J. I. C. Foot Lift you have not only a **High Foot Lift** in fact but a **Self-Leveling High Foot Lift**.

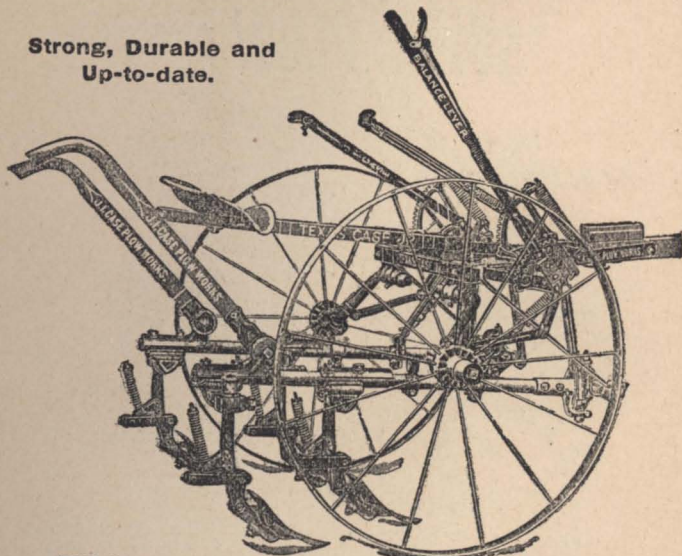
This **SELF-LEVELING HIGH FOOT LIFT** feature is a J. I. Case improvement.

These are several of the distinctive J. I. C. features. For further information apply to our nearest dealer or write

J. I. CASE PLOW WORKS, Racine, Wis.

J. I. CASE TEXAS CASE, JR. COMBINED CULTIVATOR.

Strong, Durable and
Up-to-date.



THE GANGS are made of extra heavy steel pipe, specially manufactured for us, and repeated tests have shown that they are much stronger than gangs made of extra heavy gas pipe, such as are commonly used in other makes of cultivators.

LONG DISTANCE AXLES—The wheels have capped hubs which keep the dirt out. In greasing wheel is not removed, simply the cap unscrewed, filled with grease and screwed on again. This forces the old grease out and keeps wheel perfectly lubricated for days. This is another point of J. I. Case quality.

POLE ADJUSTMENT.—The rear end of the pole is equipped with a clevis casting so that it can be raised or lowered, thus adjusting the front ends of the gangs for penetration. This often saves separate adjustment of each shovel.

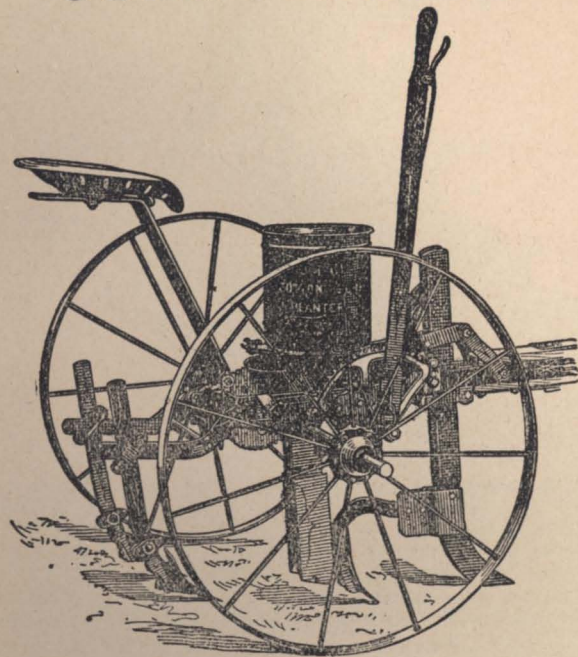
THE BALANCE LEVER can be conveniently operated from the seat. With it all neck weight is removed from the team.

THE JOCKEY gives quick adjustment for spread of Gangs, without the operator leaving the seat.


These are some of the reasons why you should buy the Texas Case, Jr. cultivator, but there are more of them—fully explained in our Texas catalogue. It is free. Write for it.

J. I. CASE PLOW WORKS, Racine, Wis.

J. I. C. COTTON AND CORN PLANTER.



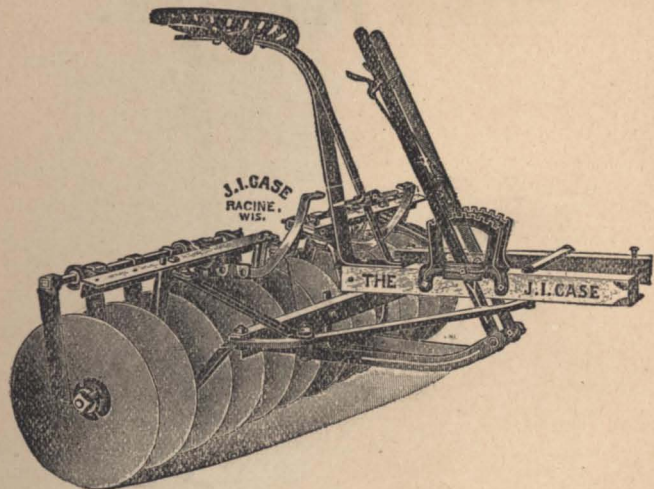
The biggest yield from every field is partly due to the use of the right implements. This one gives it. It works right in hard or soft, rough or smooth ground.

Note this special J. I. C. feature.  Rear Shovels are carried on springs independent of sweep and opening shovels. They can be used floating or locked down and can be depressed by the foot to cover in low places. One movement of lever raises or lowers all working parts and throws dropping device in or out of gear. When parts are up there is good clearance. Can plant on ridge or in furrow without change of parts. Operator can see seed dropping and knows how machine is working. Dropping device is gear driven and always works and distributes seed evenly. J. I. C. is the most COMPACT Cotton and Corn Planter.

MADE ONLY BY

J. I. CASE PLOW WORKS, Racine, Wis.

J. I. CASE DISC HARROW



The Scrapers are the slicer style, which scrape the dirt from the center of the disc to the outer edge, and when not being operated, rest at or near the center of the disc, and in that position prevent the dirt from sticking to the disc. For sticky ground they are the best scrapers known.

Chilled Ring Bearings are used on the J. I. Case Disc Harrow, which are in every way the best bearings yet devised for a Disc Harrow, Because

They wear longer;
They do not clog up or work loose;
They are easier, lighter draft;

And another important advantage is they cost less. J. I. Case Chilled Ring Bearings are worth 20 cents per pair, or four pair to the harrow, 80 cents. Other makes range from 40 to 75 cents per pair. At 40 cents, per pair, a full set would cost \$1.60, and at 75 cents per pair, \$3.00.

The difference in cost, in favor of the J. I. Case harrow Bearing is from 80 cents to \$2.20 per harrow.

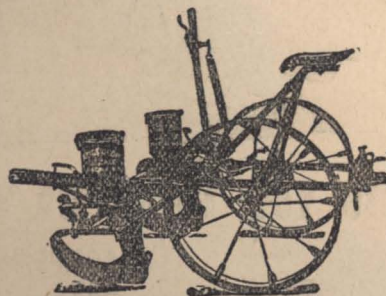
Insist on getting a J. I. Case the next time. Made by

J. I. CASE PLOW WORKS, Racine, Wis.

J. I. CASE EDGE DROP PLANTER

Better Crops and Bigger Crops
are certain with it.

Actual tests in the field prove this.



"Half The Crop Is In The Drop"

and J. I. C. surpasses all others in accuracy of drop.

The corn never wedges, the valves cannot clog. The plates being shaft driven, and the clutch certain in action, the movement of the plates is positive.

The wire having only to operate valves and clutch the strain on same is light—hence it lasts longer.

The check is perfect regardless of speed of team. No change of parts in changing from hill to drill drop.

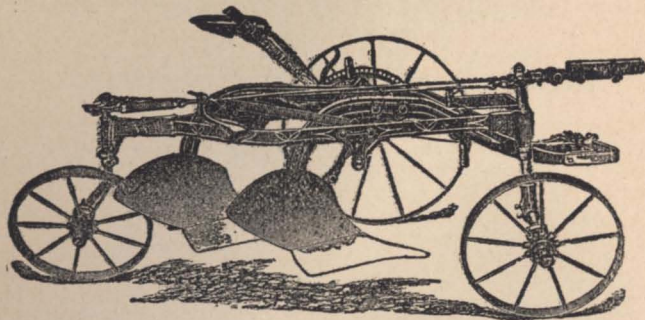
It is strong, durable and light. Works right, plants right and does it all the time.

You need one if you want accuracy of drop. Remember, "Half the Crop is in the Drop."

Made only by

J. I. CASE PLOW WORKS - RACINE, WIS.

J. I. Case **TRIUMPH** GANG PLOW



What Do You Think Of This?

**J. I. CASE
TRIUMPH GANG**

Plows 8 Miles in half
a day with 4 horses.

vs.

**COMPETITOR'S
GANG**

Plows 6½ Miles in half
a day with 5 Horses.

DIFFERENCE

In favor of the J. I. Case Triumph in one day's
plowing: **Three Miles and One Horse.**

That was the experience of two brothers in Missouri, whose names and address we will furnish on application. What better argument can we offer in favor of the Light Draft qualities of the J. I. C. Triumph? We have more evidence if you want it.

Sole Manufacturers:

J. I. CASE PLOW WORKS - Racine, Wis.

J. I. CASE ECLIPSE RIDING

Long Swinging
Easy Dodging Gangs,
High Arch,
good clearance and
View of row ahead.

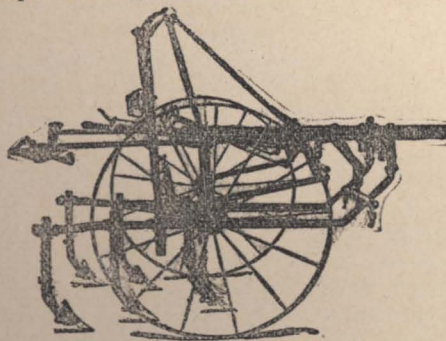
CULTIVATOR

Seat Low and
Well Back,
Balance Lever
within easy reach
of Operator.

Double Lifting Springs make gangs easy to handle and yet work perfectly while cushion effect permits the gang to be forced down when crossing dead furrows, etc.

Independent Depth Adjuster permits depth of each gang to be independently adjusted for working on side hills and in dead furrows.

Telescope Axle gives adjustable width of wheels.



Gangs can be adjusted up or down, in or out, to change their distance apart and regulate suction so shovels will always go into the ground whatever its conditions.

Adjustable Shovel Standards, shovels can be set as desired.

Perfect Lubricating Capped Wheel Hub keeps dirt out, forces old grease out and keeps wheel perfectly lubricated for days and then it is only necessary to remove cap, fill it with grease and screw it on again.

A Cultivator that does the best work with
the least labor on the part of Operator.

Made by **J. I. CASE PLOW WORKS, Racine, Wis.**

FARM IMPLEMENTS

WITH AN INDIVIDUALITY OF THEIR OWN

Each Machine Has Points of Merit That
Are Strictly J. I. Case Features

The implements described in the preceding pages are but a few of our most representative products. The J. I. Case line includes all styles of walking, sulky and gang Plows; Middle Bursters, walking and riding Listers, Harrows, Disc Planters, Cotton and Corn Planters, Drills, Cultivators, Stalkcutters, Transplanters, etc.

These implements are remarkable in many ways, but the most remarkable thing about them, and the thing that should interest you most, is **what they will do.**

J. I. Case implements have become famous because they give superior **results in the field**; and the reason for these results is—J. I. Case method. We employ the highest priced experts, and buy the best materials we can get; but back of all this is the experience of our organization, which keeps them ahead of all competition.

The evidence that we have an exclusive **method** is the fact that nearly every implement that we make has features not found in any similar implement of other make. And these features are not **experiments**, but **tried and proven successes.**

If you are interested in implements that not only **look good** on the dealer's floor; but **make good** in actual service as well, let us send you our new catalog. It is a demonstration of "Case quality" that will surprise you. It shows **why** J. I. Case implements do more work in less time, while requiring the minimum expenditure for **labor and repairs**; and it **proves that they do it.**

Catalog is free for the asking. Address

J. I. CASE PLOW WORKS - Racine, Wis.

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By

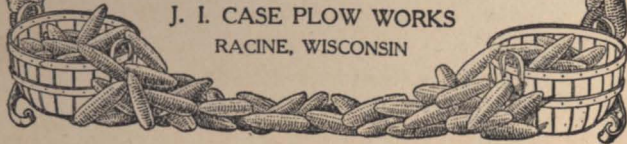
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PREFACE

The idea of this work is to group together the more important facts of farming in a plain and compact guide for reference. The farmer who has not time to study through the larger publications and select what he wants will find here a great deal of information in a small space and yet specific enough for his purpose.

What can be done in the way of securing better crops by proper selection of seed, soil, cultivation, etc.; the results obtainable from proper feeding and caring for farm animals, and many other problems of the farm, garden, or dairy are often unknown to and unsolved by the farmer, only because new methods are not tried. Progress never comes from clinging to old methods, and new crops, new methods of cultivation, new schemes for feeding are sure to increase the knowledge of the experimenter, as well as swell his bank account.

To quote a specific instance: If the information here given on the important subject "Corn," enables the farmer to increase his yield but one bushel per acre he has been repaid a thousand times in cash for the time he spent in gaining his information, and has added to his store of knowledge facts that will earn him—by each year's increased yield—a handsome sum indeed.

Too, it is fair to assume that of the millions of dollars lost through disease and insect pests, a large part might have been saved by the application of tried methods of prevention. The timely use of an efficacious remedy

may keep an entire herd or flock from extinction, and one successful treatment destroying or warding off insect pests may save an entire crop, the value of which runs into thousands of dollars.

These two aims, the increase due to the right crop being grown in favorable soil under correct methods of cultivation, and, the insurance of a crop through preventative measures, have been kept in mind in that part of the work dealing with field, garden, and orchard crops. In the part treating of live stock, poultry, and other animal life, the same thought has been borne in mind, that right methods of breeding, feeding, and growth on the one hand, and sanitary and protective measures on the other, are what the farmer most needs.

The whole, it is confidently believed, makes a concise treatise to which the experienced farmer, orchardist, or herdsman may satisfactorily refer, as well as being of exact use to the beginner.

TABLE OF CONTENTS

PART I.—FIELD CROPS AND GRASSES.

Alfalfa	7	Potato	45
Alsike Clover	8	Rape	48
Barley	8	Red Clover	48
Barnyard Grass	10	Red Fescue	49
Buckwheat	10	Redtop	49
Cabbage	11	Rescue Grass	49
Clover	12	Rice	49
Corn	15		
Corn Breeding	24	Rye	52
Corn, Diseases and Enemies of	28	Sand Vetch	52
Cotton	30	Sorghum	53
Crab Grass	34	Soy Bean	54
Cowpea	35	Sugar Cane	54
Crimson Clover	36	Sugar Beet	55
Flax	36	Sweet Potato	55
Foxtail Millets	38		
Hops	39	Tall Oat-Grass	58
Kaffir Corn	40	Teosinte	58
Oats	40	Texas Bluegrass	58
Onion	42	Timothy	58
Popcorn	44	Tobacco	59
		Wheat	61

PART II.—GARDEN CROPS.

Artichoke	71	Dandelion	75
Asparagus	71	Egg Plant	76
Beans	71	Endive	76
Beets	72	Garlic	76
Broccoli	73	Ginseng	76
Brussels Sprouts	73	Ground Cherry	76
Carrots	73	Horse-Radish	77
Cauliflower	73	Kale	77
Celery	73	Kohlrabi	77
Chard	74	Leeks	77
Collard	74	Lettuce	77
Cresses	75	Martynia	78
Cucumbers	75	Melons	78
Citron	75	Mint	78

Mushroom	78	Pumpkins	80
Mustard	79	Radishes	81
Okra	79	Rhubarb	81
Parsley	79	Rutabagas	81
Parsnips	79	Salsify	82
Peanut	80	Squash	82
Peas	80	Tomato	82
Peppers	80	Turnips	83

PART III.—LIVE STOCK AND DAIRYING.

Beef	83	Horse	100
Cattle	85	Mule	105
Dairying	90	Sheep	105
Feeding Farm Animals...	93	Pedigree Registry Associa-	
Goat	94	tions	109
Hog	95		

PART IV.—POULTRY AND BEES.

Poultry	114	Pigeons	127
Turkeys	122	Rabbits	127
Ducks	124	Beekeeping	127
Geese	126		

PART V.—MISCELLANEOUS.

Administration of Medicine.	130	Propagation and Planting	
Insectides	131	Table	133
Planting Table	132	Medicines for the Horse.	135
Gestation Table	134	Data Regarding Breeding.	136

The Farmer's Encyclopedia

PART I

FIELD CROPS AND GRASSES

ALFALFA:

Common name of lucerne, a clover-like, leguminous forage plant. It may be grown in practically any part of the United States. In many sections red clover is grown instead of alfalfa, but, where the rainfall is scant, alfalfa is of greater value.

Soil.—Any well-drained soil produces good alfalfa, but the best results are had from rich sandy loams, clay and wet lands being fatal to a long stand. As a good catch can be used indefinitely — 25 or 50 years without renewal — this is important. Plowing should be deep, care being taken that there are few weeds, as they would choke out the young plants, which do not mature for three years.

Seeding.—Different climates require different treatments. It may be sown as soon as the danger from frost is over in the northern states; in the south it is planted in September or February, while in California and adjacent states from August to December 15, and from February to April is the rule.

In the north and east the seed is sown broadcast, requiring 20 to 25 pounds of seed, when a forage crop is wanted; if drilled in for a seed crop one-half as much seed is sufficient. High mowing is necessary to prevent the crop going to seed and to kill weeds. This mowing must be some time before final frosts the first year, or the plants will winterkill.

In the irrigation sections the crop does well, but plants will be destroyed if water stands on them over two days.

Harvesting.—Alfalfa makes the best hay if cut when first blooming. It should be handled like clover, which

see. From 2 to 6 cuttings may be had per season, depending upon the locality. Five tons per acre cured hay is a common yield, while 5 to 10 bushels of seed may be reckoned upon. The second crop is usually the one harvested, being cut when the pods show dark brown. Some growers prefer a binder for harvesting and the use of the machine is rapidly coming into use.

Use.—Like clover, alfalfa is an excellent fertilizer, while its food value is first-class. For young stock, especially hogs and sheep, there is no better food than alfalfa hay. The same care should be taken in pasturing cattle and sheep on young or wet alfalfa as on clover.

Diseases and Enemies.—Alfalfa is subject to root-rot, a fungous growth working downward from the surface of the ground. It is best met by crop rotation, by trenching the infected area or by an application of kerosene or salt. Leaf spot, in which brown spots of irregular growth form on the leaves on their upper surface, is the disease most destructive to alfalfa. It is best to burn over the field each fall to avoid infection of next year's crop. Cut worms also attack alfalfa. Treatment for cut worms will be found under corn. Dodder, small, twining, almost leafless plants, which destroy alfalfa by suctorial roots, may be killed by mowing before the plant blossoms. The space should then be burned over, or if it be considerable the field should be plowed and put into a different crop. Screening will prevent the seed being planted with alfalfa which should be carefully watched for the smaller seeds.

ALSIKE CLOVER:

Favorably known and widely cultivated in mixtures for meadows and pastures, especially in low and wet marshy ones in the Middle and New England states. In the South it is not so successful nor so highly valued. It is never advisable to sow alsike alone because a better and larger amount of forage is produced when it is grown with grasses. It may be sown with oats to advantage. Redtop and alsike are as much a standard mixture for wet meadows as timothy and red clover for the better and drier uplands.

BARLEY:

Species of grain used especially for making malt, from which are prepared beer, ale, and porter, also used extensively for stock feeding, and to some extent for human food. It matures as far north as Canada.

The first state in the production of barley is California. The following states also yield extensive quantities, in the order named: Minnesota, Wisconsin, North Dakota, Iowa and South Dakota.

Soil.—To obtain a good malt barley it should be grown on a light loose soil, preferably that containing lime. When the ground is a clay or clay loam a larger quantity of grain is obtained. For market purposes malting barley is generally preferred as a better seller. Barley requires a deep plowing and soil pulverized and is a good crop to follow another for which the land has been well fertilized.

Seeding.—The time of seeding depends upon the locality. In the North it is sown between spring wheat and oats, the plants being sensitive to frost and also subject to damage by drouth or bad weather. In the South barley is grown for pasturing rather than for seed, being sown in September or early in October. This makes it an excellent pasture. It may be pastured in the winter as well as in the fall and spring. When broadcasted or on rich soil, 10 pecks to the acre is ample and when conditions are not so favorable 8 pecks is sufficient. The seed should be put in about 3 inches in depth.

Fertilizing.—A grain having little protein but rich in starch, may be grown on a light soil well fertilized. The purpose of the crop must be kept in mind in fertilizing as different soils and fertilizers produce grain suited for different purposes.

Barley is grown more for feed every year and less for sale. There has been a prejudice against it because difficult to handle and often if not well threshed contains beards which are injurious to stock. This, however, is remedied by better threshing methods.

Harvesting.—As the color of the grain affects the price where it is to be sold for malting, attention must be paid to the color which the grain will show when threshed. Dark grain is not favored, the highest price being paid for bright. Grain cut late is liable to be dark, a good time being about two days after the grain is in the dough.

The grain will be discolored by heavy dews or rain and should be carefully shocked and stacked as soon as possible. The West produces the best and brightest barley for malting purposes, as there is little dew and few rains to discolor it.

Varieties.—There are two classes of barleys: the hulled and hulless. Hulled barleys are two, four and six-rowed, the two-rowed variety being held the best for malting.

For feeding the six-rowed is best. Hulless barley is grown only for feeding purposes, the main varieties being the white and the black.

Value for Feeding.—Barley ranks about the same as wheat or corn as a grain for feeding. Its feeding value is possibly somewhat more than that of oats. It is best fed ground and usually good results are had by feeding with ground corn. When fed to horses, however, the hulled grain is preferable. Hogs grown for bacon do particularly well when fed on barley.

It is not necessary to take such care in harvesting barley for feed, as discolored grain is of as much use for feed as though it were perfectly clear. Barley grown for hay is not of great feeding quality and is only put in where other plants do not mature.

Enemies.—There are two kinds of smut which render barley worthless—covered smut and naked smut. It attacks the kernels, massing them together in a form which hardly separates when threshed. Naked smut is similar to covered smut but breaks apart as soon as the kernels mature. To treat smut in barley seed it should be given a preliminary soaking of from 4 to 8 hours, then be subjected to hot water at 132 degrees F. for five minutes. Besides the smuts attacking barley it is subject to ergot, rust, joint worm, Hessian fly and grain aphid.

BARNYARD GRASS:

Requires a rich and somewhat moist soil. It is coarse and succulent, and is not easily cured into hay, but it is quite valuable for soiling and for the silo, as it yields heavily, and produces an unusual amount of seed.

BUCKWHEAT:

A minor grain grown principally for flour. It is sometimes grown as a honey plant and sometimes for green manure. The greater part of the buckwheat crop of the United States comes from New York and Pennsylvania, though the other states grow small amounts.

Seeding.—Buckwheat is planted late and is often sowed where corn or some other crop has failed. It matures in about 70 days. The seed may be either drilled or broadcast, from two to three pecks being sown per acre.

Harvesting.—The grain ripens unevenly and it is best to cut the crop soon after the first seeds ripen. It is

usually threshed in the fall, as it cannot be stacked because it draws moisture and is thereby damaged.

Yield.—Good ground yields about 40 bushels per acre.

CABBAGE:

A cole crop, grown for the dense rosette or head of leaves. Grown commercially on an extensive scale in many parts of the country, and large profits are often realized. Net returns in excess of \$100 per acre are frequent among experienced growers near good markets.

Soil.—A deep soil which is cool and has the power to hold an abundance of moisture is to be preferred. Sandy loams are almost ideal. Any land for cabbage must be thoroughly drained. There is no danger of making land too rich for this crop. About 30 loads of good stable manure may be applied per acre. About half of this amount should be applied and plowed under and the other applied after the soil is plowed and its incorporation with the land effected by means of harrowing. Very coarse manure cannot be so applied.

Seeding.—For early planting in gardens, seed may be sown in shallow boxes kept in the house and the plants transplanted at the proper time. Fall or mid-season varieties are sown in beds outdoors and the plants removed when ready to transplant. Commercial growers sow the seed for early planting in hotbeds and transplant from them as soon as weather conditions seem to warrant. Plants are made hardy by removing the sash a short time every other day for a week or ten days before planting. Plants are set from early spring until about the first of July in Wisconsin and other northern locations. The Imported Holland seed, also the Danish, is grown extensively in that region for market. It should be planted about 30 inches apart each way. The ground is marked off with a marker similar in form to a common hand hay-rake. Four to six ounces of seed are required per acre.

Transplanting.—Commercial growers use a transplanting machine which will set from 30,000 to 45,000 plants in a day, or about 3 to 5 acres. It is a most ingenious machine, requiring two men to feed the plants into it. The plants are then handled by the machine or the fingers, as they are called, and placed in the ground and at the same time there is an automatic arrangement whereby a jet of water is poured on the ground just where the plant has been set. These machines are thoroughly practical and they can be bought at a reasonable figure, and it will pay even the small grower to use them.

Cultivation.—Hand cultivators are used only on very small places. Where cabbage is grown largely the two-acre walking or riding cultivator is used. Prominent manufacturers of implements have recently provided a closer range of adjustment, so that cabbage may now be cultivated the same as corn.

Harvesting.—Commercial growers prefer to sell the crop in the fall. In summer and until late fall the cabbages are cut and packed in crates for shipment, 50 to 100 in a crate. Heads of uniform size should be crated, and the smaller ones sold or retained for manufacture into kraut. Live stock breeders grow or buy large quantities of cabbage for feeding to sheep and other varieties of stock.

Storing.—Cabbage may be stored for winter—keeping in a trench 4 feet wide and about 14 inches deep. Pull up the cabbages without shaking the dirt off the roots and place them head downwards in the trench, having previously covered the bottom of the excavation with straw. Wrap the leaves of each plant closely around the head and place the cabbages very close together, throw a few inches of straw over them and cover with about two inches of dirt. Later, when the weather is colder, throw on a little more dirt, and when freezing weather comes put on still more, so as to guard against their freezing.

Varieties.—For early cabbage the Charleston Wakefield is unexcelled. For second early, the Newark Flat Dutch and Henderson Early Summer are favorites with many commercial growers. As a main-season variety the Premium Flat Dutch and Holland and Danish from imported seed is probably the best for northern locations.

Cabbages have several enemies: Root maggots, against which slips of tarred paper have been used successfully; cabbage worms, which may be destroyed with pyrethrum or kerosene emulsion, and club roots for which there is no known remedy, except the rotation of crops; rot is a disease of the root extending into the head.

One ounce of seed will produce 1,500 to 3,000 plants. Ready for use in 100 to 160 days.

CLOVER:

One of the various species of plants numbering about 150 varieties, mostly low herbs, found chiefly in the temperate regions of the northern hemisphere. Some varieties are merely weeds, but many are valuable as food for stock.

The most important use of the clovers is that of forage, though they are also excellent renovators of the soil, their long roots running deep downward and their growth above ground obtaining nitrogen from the air, later to be given to the soil upon the decay of the plants.

The most important species of clover are the common red clover, the mammoth red clover—sometimes called sapling clover—crimson or scarlet clover, white clover and alsike clover. Sweet clover and alfalfa are sometimes called clovers, though not properly so named.

Red Clover (Common) or June Clover.—In the northern, central and eastern states this is one of the most important forage crops. In the south cowpeas takes its place, and in the west alfalfa is commonly grown. Besides its use for hay it is extensively used for green manure. Depending upon the locality, clover lives two or more years, being from one to two feet in height and producing two crops of hay each season. But one crop of seed can be grown per season from clover, as the first flowers are not cross fertilized. An average yield of clover hay is 1½ to 3 tons per acre.

Soil.—Red clover may be grown on almost any soil, but a well drained clay loam is best. A good growth of clover denotes a good chance for almost any crop as wheat, oats or corn, as any of these will flourish where a good crop of clover grows. To renew land worn out by exhaustive cropping clover is one of the best mediums to be had, as it renders the soil friable and adds the nitrogen to it.

Seeding.—Clover is sown broadcast at a depth of about one-half inch, 10 to 12 pounds per acre where used alone being sufficient. Timothy and clover is a standard mixture in many parts of the United States, about 6 pints per acre being used.

In the North fall seeding is liable to kill and should consequently be seeded in the spring, often good results being had from seeding on the snow in March or later. Sometimes where winter wheat is put in in the fall and the timothy and clover mixture is used the timothy is best sown with the grain in the fall, the clover to be added in the spring. A better stand of clover is usually obtained from seeding with wheat than with oats, rye or barley.

In buying clover seed especial care should be taken to secure seed free from weeds, as it is often mixed with weed seed. Some of the seeds sometimes found in clover are dodder, buckhorn, broadleaf pliantain and yellow trefoil.

Haying.—The time for cutting clover for hay is when about three-fourths of the plants are in bloom. It is then most valuable for forage and if cut later is too woody. The leaves are particularly valuable for forage. Care should be taken not to let the hay get too dry, as the leaves will fall. For making hay, as soon after cutting as the leaves wilt the hay should be raked and put in small cocks. About one day, if the weather is clear, is sufficient for curing. It should be packed close in the mow and should be allowed to cure for some time, air being kept out of the barn as much as possible.

Silage.—As a silage crop clover is second to corn, being superior to hay cured in the ordinary manner. For silage clover should be cut the same as though it were to be used for hay. It should, however, be put in the silo direct from the mower. As the main reason for the spoiling of silage is the bulking up of the material, allowing the admission of air, clover should be run through the cutter before putting in the silo. Because of the fact that clover silage does not depend upon sunshine for curing makes it much more valuable than when used as hay, as in this way a great quantity of excellent forage may be secured.

Seed.—As the hulls of the first crop are generally not well filled, the second crop is the one cut for seed, being cut when the clover heads are ripe and show dark brown. Clover is cut for seed with a mower and handled as though it were hay, though a method often practiced is to cut it with a binder as grain is usually harvested. When so cut it is not threshed out as much in handling and less seed is lost than when cut with a mower. The ordinary yield is one or two bushels per acre.

Feeding Value.—As a fodder for sheep and cattle clover hay is in the first class. It is more dusty than timothy and not so well liked by horses and should not be fed to them as a main food on this account. Poultry are often given steamed clover hay in the winter. As a pasture, clover is adapted to any of the domestic animals. Cattle and sheep should not be turned upon clover pasture when the plants are damp, either from rain or dew, as wet clover will produce bloat. There is little danger from this after they have become used to the pasture, however, not being as dangerous as alfalfa under the same conditions. Clover is especially good for hogs.

Green Manuring.—The best plan for using clover for green manure is to turn under the whole crop. Pasture it during summer and turn under in fall.

Varieties.—The mammoth red clover resembles closely the common species, but is much larger and is later in maturing. When mixed with timothy it matures about the same time, and but one crop is secured. Crimson clover is best adapted to the middle and south Atlantic states, making one of the best orchard winter covering crops known. Alsike clover resembles both the common red clover and the white clover, the blossom being pinkish white. It is adapted to certain conditions where common red clover or alfalfa will not grow, standing freezing in good shape. The common white clover is but little sown, but spreads itself into meadows and pastures. It is valuable for bees.

Enemies.—Stem-rot produces swellings on the stem; leaf-spot produces black spots on the leaves, and rust, a reddish powder, injures the quality of the plant. The midge may be prevented by cutting the first crop very early; the clover hay-worm feeds upon the hay. It may be destroyed by fumigation with bisulphide of carbon. The clover leaf midge attacks the leaf but does not damage the plant to any great extent. Root borers may be destroyed by plowing infested fields in June so as to kill the grubs by exposure to the sun. There are perhaps 200 other species of insects which attack clover, such as wireworms, cutworms, locusts, etc.

CORN:

Maize, the most common and important field plant of the United States; also its seed. The importance of corn is best shown by the fact that four times as many bushels are grown as wheat. In 1905 10,000,000,000 bushels were grown in the United States. With the exception of Alaska every state and territory grows corn. To a larger extent than any other crop, corn has been studied and experimented with, and the farmer can gain more from a careful study of what has been done in corn culture and breeding, than from years of individual experiment.

Soil.—The ideal soil for corn is rich, moist, mellow loam, deep and warm. This is common in the corn-belt states. Well-manured pasture land and clover sod are favorites for turning under for corn in the Mississippi valley. While the corn plant, because of its branching roots six to eight feet in length will grow on poor soils, it will not produce good grain unless the soil is rich enough to provide for a good growth of stalk. So, too, the best yield of ears is not obtained unless the stalks have made a normal growth. For this reason some other plants will

produce small or fair crops on soil too poor to produce corn. For instance, a cotton plant adjusts its yield of lint to the fertility of the soil, a small plant producing a small number of bolls containing lint of as good quality as that from a larger plant bearing many more bolls.

Plowing.—Where there is danger from drouth or from grubworms, cutworms, and cornworms, fall plowing is to be preferred. A common custom is to plant upon the spring plowed land after dragging or pulverizing. In sections where there is much rain during winter, it is better not to harrow fall-plowed lands in the autumn, especially fine clay soils in a rolling country. In comparative tests of fall and spring plowing, preceding a dry summer, the fall-plowed fields have generally yielded better. Deep spring plowing and spring subsoiling often result in diminishing crops, especially if done after the spring rains.

Depth of Plowing.—For a deep, rich soil, deep plowing is best done if done in the fall. For thin clay soils in some parts of the country subsoiling is better than very deep plowing, because it does not turn the compact clay to the surface, yet loosens the soil to a good depth. The plowing should not be at the same depth from year to year, as by such a practice the soil is not mixed well; a hard surface is left at the bottom of the furrows where the horses walk and the plows drag. A little subsoil turned to the surface each year allows the elements to act upon it, liberating plant food, and as it becomes mingled with surface soil and vegetable growth, the soil depth will be increased. To accomplish these results it is well to plow a little deeper each year for several successive seasons, and then for one season give a plowing at about half the depth of the deepest plowing.

Planting.—Throughout the chief corn-growing sections it is the general experience that corn planted early gives the best yield. In the northern states there is little choice as to time of planting. Corn should be planted as soon as the ground is sufficiently warm; most of it is planted between the 1st and 20th of May. Corn should not, of course, be planted in cold or wet ground simply because the calendar shows that the usual planting time has arrived; the right time will suggest itself to the intelligent farmer. More than 90 per cent of corn is now planted by means of a check rower or two-horse planter. One man and team can plant in straight rows in both directions across the field fifteen to eighteen acres per day, thus admitting of cross cultivation.

There is an old saying that "When oak leaves are as big as a mouse's ear it is time to plant corn." Fields planted early frequently escape attacks of the bud-worm, while later plantings of the same year suffer severely.

If the seed has been properly selected and graded by running it through a fanning mill, the modern corn-planting machines with the new edge-drop or improved round-hole plates can be made to drop with remarkable accuracy. The proper depth to plant must be governed by the character of the soil. If it is a stiff, heavy clay containing plenty of moisture at planting time, 1 inch is sufficiently deep; but if it is a light open, dry soil, 2 to 3 inches is advisable. If the corn is planted deeper than 3 inches there is danger that the seed will rot before it sprouts, or if it finally grows will give weak, sickly plants.

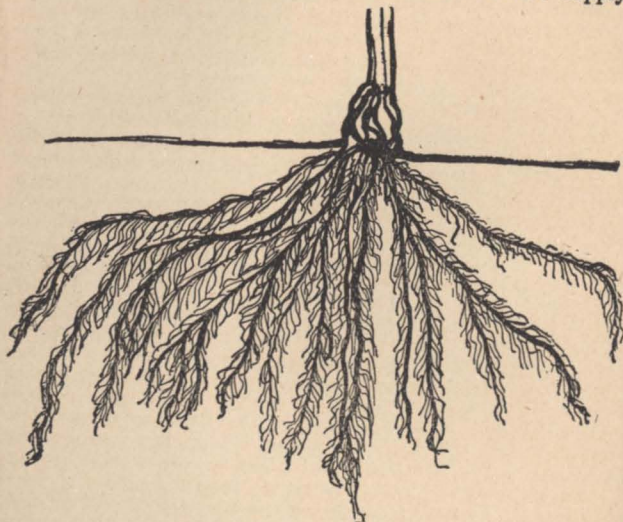
The lister is used for plowing and planting fields that have been thoroughly plowed and also for planting directly in last year's cornfield or stubble field without previous preparation. This latter practice, however, is not recommended for shallow or stiff clay. By planting in a deep furrow as is done with the lister in some sections weeds in the corn rows are covered by cultivation, and as the furrow becomes filled by cultivation the root system is placed at a greater depth. This requires a special cultivator but the corn is thus better enabled to endure drouth, and the stalks are not so easily blown down. On soils where corn can be listed without previous preparation of the ground this method saves labor, but it can be successfully employed only on very deep loose soils.

Experiments in Iowa have shown that there was no difference between hills and drills where there was the same number of stalks. For example, three stalks 42 inches apart have given the same results as where the stalks were 14 inches apart. In the corn-belt the usual distance between rows and between hills in the rows is 3½ feet. This gives 3,556 hills per acre. If planted thicker than this, the weight of the stover increases and the production of ears decreases. Small-growing varieties should be planted thicker than varieties producing tall stalks. When grown for silage or fodder thicker planting is practiced.

The distance for planting in a particular soil should be decided upon and the planter adjusted to plant accurately and regularly. The custom of planting a little thicker than the stand of stalks desired is not a good one. A harrow or weeder may be used when needed to break a surface crust

or kill young weeds that start before the corn is up or large enough to be worked with other implements.

There is small danger of cultivating too deeply the first time because the plants are small and the root system undeveloped, so that no injury will result to the roots. Care should be taken, however, not to cover any of the plants. To this end fenders should be used on the cultivators. During the succeeding cultivations great care should be exercised not to cultivate deeply, as then root pruning will be done, and the food and moisture supply



Root development of corn.

of the plants thus curtailed. Probably the greatest injury is done when the corn is laid by, as there is a feeling that this being the last chance at the weeds the cultivator should be let go down. On the contrary, this is the time to cultivate shallow. Deep culture at the outset is believed to insure deeper rooting by the plants and thus enables them better to withstand drouth and the effects of deep cultivation later in the season. Surface culture, however, has invariably given better results than deep culture when both have been applied continuously during the growing season.

Many comparative experiments of deep and shallow cultivation have been made, and the results favor shallow cultivation. There are but few occasions when deep cultivation is preferable. If excessive rains have packed the soil and kept it water soaked deep cultivation will help to dry and aerate it. Breaking or pruning of the roots of the plants must be avoided so far as possible. If roots are pruned the plants will rapidly produce other roots, but it will be at the expense of the vitality and food supply. After the plants have reached a height of two feet, the soil, even in the middle of the rows, should not be cultivated deeper than three and one-half inches, and three inches or less is usually better. For retaining soil moisture a loose soil mulch two or three inches in depth should be maintained.

Corn should be cultivated often enough to keep down the weeds and to constantly maintain a loose dust mulch. To this end a greater number of cultivations will be necessary when rains cause the surface soil to run together and crust. This crust must be broken and the soil mulch restored, or evaporation will soon rob the soil of its moisture. The longer the drouth the more frequent should be the cultivations. After a mulch has been produced its frequent stirring is necessary, in order to prevent the ground from becoming hard and losing moisture rapidly. One object of cultivation is to restore the soil mulch as soon after a rain as the condition of the ground will permit. If this time is allowed to pass and the ground becomes hard and baked dry, the crop will suffer greatly, for the cultivation of hard, dry ground breaks it up into clods, allowing the air to penetrate and causing more injury than if such cultivation had not been given at all. Many crops are cut short by stopping the cultivation because the corn is too tall for the use of the double cultivator without breaking down the stalks. If the condition of the soil demands it shallow cultivation should continue so long as it can be given with suitable implements without injuring the plants.

Harvesting.—Where the crop is wanted for fodder it should be cut when the blades first begin to dry and the kernels are well dented. When grain is the object the ear should be well ripened. When both fodder and grain are wanted, it should be harvested at a time intermediate between these two stages. For silage dent varieties should be cut when well dented and flint varieties just after glazing has taken place.

There are many methods of harvesting corn—husking in the field, husking from the shock, “snapping” or “picking” in which the husks are left on the ear, cutting by hand or

with the modern corn harvesters. When corn is husked or snapped in the field, stock is usually turned in after gathering. In order to obtain the most feed from the crop it should be put in the shock.

Varieties.—Dent corn and flint corn are the two broad classes of field varieties. The former is grown almost exclusively in the corn-belt; the latter in New England and the South. Dent corn has the following characteristics: Wedge-shaped kernels with pits or dents at top; heavy crops, woody stalk. Flint corn has a hard, smooth kernel, more or less oval, with smooth top; is of rapid growth; stalks not so woody as dent corn; easily handled; preferable for silage. Dent corn has two types, white and yellow, there being practically no difference in either feeding value or yield. White has slightly outyielded yellow corn in some parts, but the difference is not material.

Names of varieties are often not distinctive because of mixing of names by seed-corn dealers and the mixing of varieties by cross-pollination effected by the wind, so a varietal name is of little significance in comparison with the vigor, productiveness, and purity of the seed. Leaming is as constant and well recognized a variety as exists, yet seed ears purchased under this name in Connecticut or New York are, in appearance and productive ability, usually as unlike ears of Leaming purchased in Ohio or Illinois as they are unlike ears of other varieties. However, corn breeders have been at work for years to counteract this condition, and have selected seed for deep kernels, small cobs and well-filled tips and butts, and produced varieties which may be considered standard. The Illinois Seed Corn Breeders' Association recognizes seven breeds of corn (four of yellow), namely, Leaming, Reid's Yellow Dent, Golden Eagle and Riley's Favorite, and (three of white), namely, Boone County White, Silver Mine and White Superior.

Seed.—It is wonderful what can be and has been done by the use of proper seed for planting. Where corn is purchased from a grower, it should be bought on the ear. The chief characteristics of good seed corn are as follows: Cob, small, with tip almost entirely and butt well covered; kernels thickly placed in straight rows and having kernels full and plump at the tip next the cob. The ears should be sound and firm.

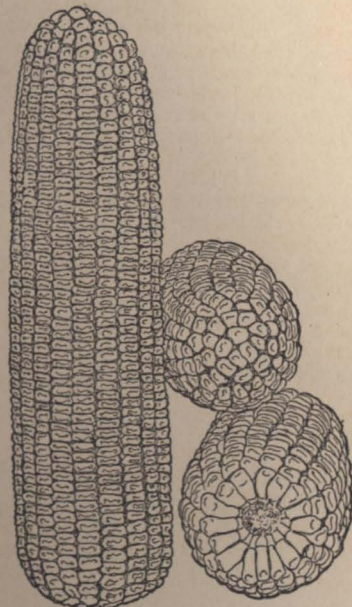
Some of the points to be observed in the selection of seed corn are:

(1) Size and shape of ear; ear should approach as nearly as may be a uniform diameter from end to end.

(2) Size and quality of cob, a medium-sized cob being much better than a large, spongy one.

(3) Depth of grain.

(4) Shape of grains; grains should carry their wedge shape uniformly to the end, so that the ear may present as nearly as possible a solid surface.



An excellent type of Reid's Yellow Dent ear, with examples of a well-filled tip and score-card butt.

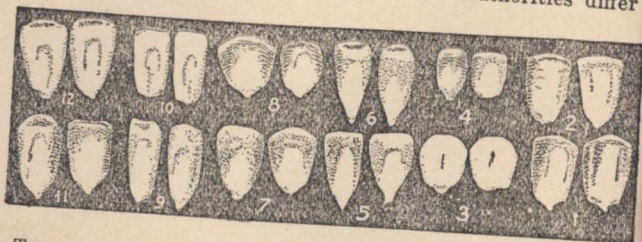
(5) Covering of cob; cob should be as completely and evenly covered as possible at both ends.

(6) Hardness of grain, too hard and flinty a grain not being readily masticated and digested. A hard grain, also, is more liable to be a shallow one.

(7) Grains of even, uniform size and similar shape, to make possible uniformity of planting.

(8) Color of grain, purity of color indicating purity of the corn.

Seed corn should be selected from the stalks when thoroughly matured, as field-cured corn is much the best. Free circulation of air among the ears is necessary and the old-fashioned method of tying the husks of several ears together for hanging is still followed. When once thoroughly dry seed ears will not be injured by ordinary changes of temperature. Before planting, tests for vitality of the seed should be made, taking 4 to 6 kernels from each ear. These may be placed in a shallow box or common dinner plate containing moist sand and kept in a moderate temperature about eight days. Kernels not having firm, strong sprouts by the end of that time indicate that the ear should be discarded. Authorities differ



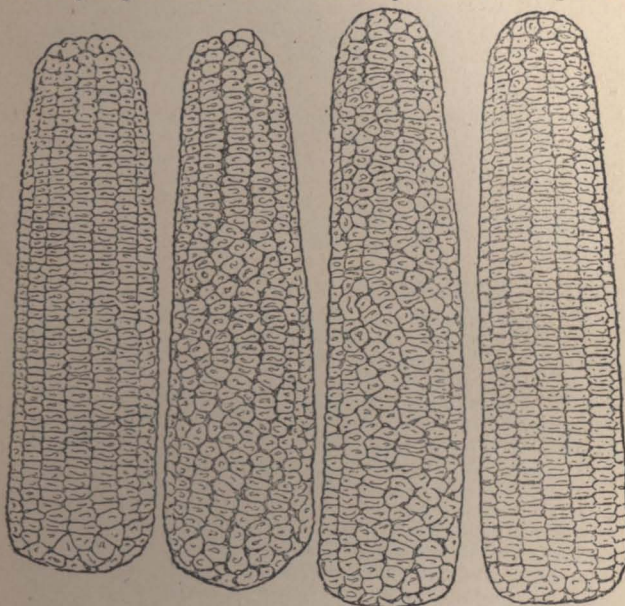
Types of kernels, 1, 2, 11 and 12 being the most desirable in the order given.

as to the relative value of the butt, middle and tip seed. An immediate advantage of using only middle seed is that the kernels are dropped with greater accuracy by the planter. In general, moreover, the larger kernels are to be preferred.

Feeding.—Corn is rich in starch and oil, and is used as a feed for stock of all kinds whenever fat is wanted. In the corn-belt corn is fed to fattening steers in one or more ways, depending generally more upon the facilities for feeding than upon any other consideration. Some stockmen keep their steers in small enclosures and give them corn in the stalk, the ears being soaked before feeding; others feed the corn dry on the stalk to steers in the open, letting the hogs run after the herd and pick up all dropped kernels. The last is a common practice and considered an economical method of feeding. One thing has been thoroughly shown, and that is that husking corn is a waste of time where it is to be fed to cattle or other

stock, as the animals may as well get at the corn themselves. However, if the variety of corn has a very large ear or very tough cob it is common to break the ear into several parts or run through a crusher. If corn is ground for fattening stock, it should always be remembered that it is a concentrated food, and liable, especially in the last stages of feeding, to put stock off their feed.

Corn is the standard food for hogs. In fact, most of the hog crop of the United States may be said to be grown



Ears lacking uniformity and showing different characteristics.

on corn from weaning to market time. The quality of the flesh is improved if fed with some nitrogenous grain as barley or peas. There does not seem to be any advantage from feeding ground corn except when fed to young pigs. When the meal is fed it should be soaked or fed as a mash, as better results will be obtained than when fed dry.

Corn makes excellent feed for sheep. It should be fed dry. For feeding qualities of corn for the horse, see under Horse.

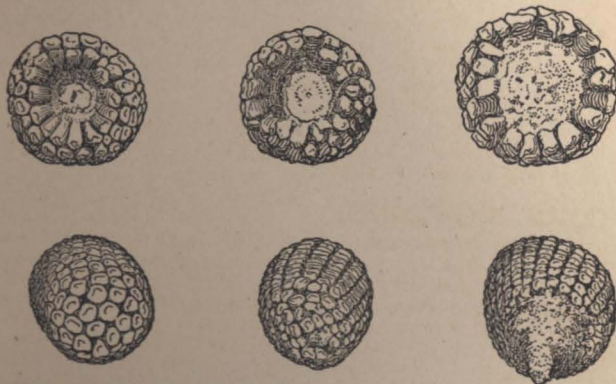
Fodder Corn.—Perhaps the best way to save corn for fodder is to cut it with a corn harvester, and run it through a corn shredder. More and more corn is cut every year for fodder. Corn closely drilled in so that the ears are about half size makes an excellent fodder.

Indian corn is the great silage plant of America, the larger dent varieties being the favorite ones. Burrill and Whitman is one of the best known varieties, but for regions in the northern corn-belt it does not mature soon enough to be entirely satisfactory. As a rule, the best corn for silo in any locality is that which will be reasonably sure to mature before frost, and produces a large amount of foliage and ears. Wisconsin Yellow Dent does well on the northern line of dent corn growing, while Burrill and Whitman, Leaming and Dungan White Prolific will do well farther south. The common Southern Horse Tooth and Mosby Prolific are well adapted to the southern states and are heavy yielders.

CORN BREEDING:

Physical Improvement.—Prof. P. G. Holden, of the Iowa Experiment Station, is probably the father of the campaign which has resulted in the physical and chemical improvement of corn. About ten years ago he began to teach that the cereal could be improved by careful, persistent selection of seed ears of a given type each season. Experiments were conducted which proved the value and practicality of this work. Like produces like. On this basis the grower can produce almost any type of ear he desires by selecting his seed ears for certain characteristics, and planting them where the pollen from neighboring fields cannot fertilize the breeding plants. Corn breeding plots should be at least 80 rods from other varieties of corn. Practical breeders want an ear about 10 to 11 inches long and from 7 to 8 inches in circumference, shelling about 88 per cent corn to cob. White corn should have white cobs and yellow corn red cobs in order to be classified as pure-bred. The butts and tips are shelled off and only the central kernels used for seed. The row system is followed by breeders. The kernels from each ear are planted in one row; that is, one ear plants one row. Usually the breeding plot is planted by hand. When the plants have begun to tassel go through the plot and detassel all

stalks which show signs of producing ears, so that the pollen (borne by the tassel or male organ of the plant), cannot fertilize the silks (or female organs) of plants which promise good seed. If this fertilization should take place the tendency to barrenness would be transmitted to future seed. By planting an isolated plot of an acre or more each season with specially selected seed, picked for its trueness to the desire type, any farmer may effect marked improvement in any variety of corn. The improvement spells more corn and hence greater profits to the grower. No matter how perfect the seed ears in appearance, they are useless for improvement work if they are weak in vitality or germinating power. Every

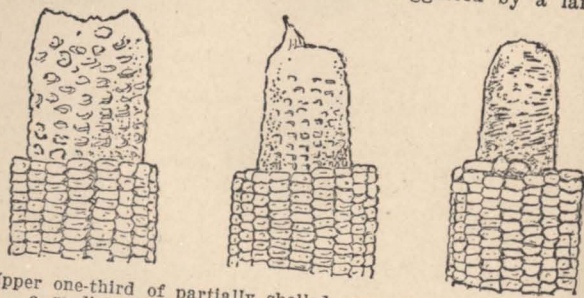


Butts and tips; the left two are good; middle two, poor; right, two, very poor.

seed ear therefore should be tested as already directed. To warrant its use for planting an ear should show a germinating strength of at least 97 per cent; that is, out of every 100 kernels tested at least 97 of them should produce healthy plants. Breeding plots which cannot conveniently be isolated may be placed in the center of a large field of corn of the same variety as that in the plots.

Chemical Improvement.—In 1896 the Illinois Experiment Station inaugurated experiments to change the chemical composition of corn. The variety selected was Burr's White, a local dent corn, a good yielder. Chemical analysis had shown that the ears varied materially in composition

but that the kernels on a given ear were fairly uniform in this regard. Consequently by analyzing a few kernels from each ear its percentage of protein, oil and starch could be determined approximately. Some ears were found to be high in protein or low; others high or low in oil; others high or low in starch. The experiments were to determine whether by selection of high protein ears, for example, this valuable content could be increased. The work has proved a great success as well as a revelation, showing that the breeder can alter the composition of corn according to his fancy or needs simply by using for seed ears which show a large percentage of the ingredient desired. Chemical analyses are not essential in order to ascertain the composition of the corn, though in scientific work the laboratory must be used. Experienced corn breeders can tell by a physical examination whether a kernel is high or low in any of the three constituents named. A preponderance of protein is indicated by a large amount of hard, flinty, translucent material and large heart; a high content of starch is suggested by a large



Upper one-third of partially shelled ears, showing a large cob, a medium-sized cob and a small cob. The middle ear is the best type, having a deeper kernel than either of the other ears.

amount of white material at the top of the kernel and at the edges; a large percentage of oil is shown by the extra size of the heart or germ. Corn can be so improved in any of these several regards that it is rendered more valuable for specific purposes, and commands a premium on the market in some localities. High protein corn is preferable for stock feeding, especially for young or growing animals. Corn with a large percentage of starch makes it more valuable for use by glucose factories or starch manufac-

turers, and the more oil corn contains the more valuable it is for manufacture into certain foods made for human consumption, corn oil being commonly used for olive oil. Thus it will be seen that the breeding of corn to increase or decrease its chemical composition is of commercial value.

Those who desire to breed corn along this line should be willing to give it much attention and extra labor. It is hardly practical for the farmer to start it with native seed. He better secure seed from growers of reputation who already have attained to certain standards.

Detasseling.—Experiments in recent years have shown that yields may be appreciably increased by detasseling alternate rows and thus avoiding in-breeding. This method makes corn breeding a more definite process than it ever before has been. Actual sires and dams, as in animal breeding are established. Select 50 seed ears for example, and plant them individually in as many rows, the row being long enough to require all the good kernels for planting it. Before the pollen matures on the plants detassel every other row and from the detasseled rows select the seed for next year's planting. A portion of these ears will serve for sires and another portion for dams. Detasseling is practiced as before and a similar selection of seed made. This absolutely prevents in-breeding and brings together unlike blood each year, so that strong strains may be blended and the constitution of the corn strengthened. This work is practical and it pays.

Uses of Corn.—Corn is now used to a greater extent in the manufacture of foods for human consumption than ever before. The number of uses to which the grain is put is large. Immense quantities are used in the manufacture of alcoholic liquors. Some of the products made of the grain are mixing glucose of three kinds, crystal glucose of four kinds, grape sugar of two kinds, anhydrous sugar, pearl starch, powdered starch, refined grits, flourine, dextrine of four kinds, corn oil, corn oil cake, rubber substitute, corn germ, granulated gum. The oil is used to a considerable extent in some foreign countries for the manufacture of soft soap. Fiber is made from the shell or outer portion of the stalk. The inner portion or pith is ground and converted into a product called cellulose, which is used in packing the coffer-dams of warships. Varnish also is made from the shell. The leaves and other portions of the stalks are ground into stock foods. The cobs are turned into cob pipes also by a process of fermentation converted into vinegar. The increased commer-

cial uses of corn have aided in sustaining its price in recent years.

DISEASES AND INSECT ENEMIES:

According to a leading entomologist, there are about 225 species of insects which attack different parts of the corn plant. In the corn-belt probably the most serious insect foes of the corn plant are those which infest the planted seed and the roots. The wire-worm belongs to this class; so does the corn root louse. Root blight, a fungous disease, also works on the roots. Corn, failing to make satisfactory growth, usually is the victim of either a disease or insect pest. Plants that wither or turn yellowish in most cases owe their abnormal condition to the work of wire-worms or the well-known white grub. There is no mistaking the work of cutworms, the tender young plants, clipped off at the surface, leaving no doubt as to the identity of the marauder. Greater injury can be done to the corn plant by underground enemies than those which confine their operations to the aerial part of the plant, yet there are insects and fungous diseases which form a serious menace in certain seasons and communities to the above-ground plant. In combating insects and diseases an ounce of prevention is worth pounds of cure. For this reason the corn-grower should rotate his crops and do his plowing with a view of routing or circumscribing those pests which his experience has shown do most injury to his crops. Fields planted successively to corn are almost sure to be invaded by insects which might be avoided through the systematic rotation of crops.

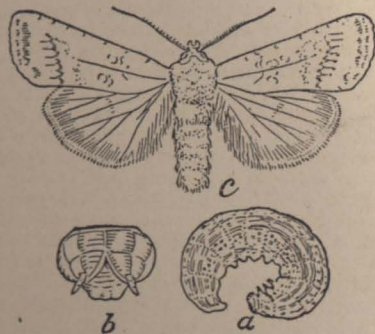
Smut shows first on the leaves, afterwards attacking the ear, leaving it a shapeless mass of black powder. There is danger from smut especially where cattle are allowed to run in the stalks. It is said to produce abortion in cows with calf. There is no practical treatment for it.

Rust like that attacking wheat sometimes troubles corn, but usually is too late to do it much damage. Blight affecting the whole leaf may be counteracted by burning over the ground. Wilt in which the plants affected shrivel up, has no known treatment after the plant is once affected.

Among the many insects attacking corn only a few of the most important can be given. Boll worm attacks cotton and other plants as well as corn. It is treated under Cotton. The corn root worm, the larva of which bore into the corn roots; is not very injurious to large sections of corn. Corn delphax, in which the larva come

from eggs lodged in the midribs of the leaves, and penetrating them, is combated by a spraying with kerosene emulsion. The stalk borer works in the stalks and in the cob; there is no known remedy for it after it attacks the corn. The chinch bug is treated under Wheat; it attacks corn as a general thing only after being driven from wheat or barley.

Cutworms.—Growing corn, especially that put in on sod, is subject to the attacks of cutworms which sever the stalk about 1½ inch below the surface. The danger from these worms is greater because there has generally been no provision made for their prevention, as they occur in localities where it is not customary to combat any of



One of the cutworms attacking corn, cabbage, tobacco, etc. a, larva; b, head of larva; c, adult.

the insect enemies to corn. What is known as the poisoned trap system is used on land subject to their ravages. This consists in scattering bunches of grass through the fields or placing here and there a turnip or cabbage leaf and collecting from time to time the cutworms gathering under them. These vegetable traps may be poisoned with Paris green and the trouble of examining the trap and killing the worms by hand may be avoided. Another method is to poison a patch of grass with a broadcast sprayer, afterwards cutting it and distribute it in little bunches here and there through the field. Any early vegetation may be used in this way and extensive fields can be economically rid of the worms before most crops show themselves above the ground.

COTTON:

The name of several species of the Mallow family or the lint they produce. The cotton belt embraces the states south of a line drawn from southern Virginia to northern Oklahoma. Texas is the leading cotton state. The average annual yield for the United States is 10,000,000,000 bales.

Soil.—Unlike corn and the small grains, cotton is able to yield a crop on less productive soil. The plant has a long root reaching well into the ground. A drained clay loam or sandy loam with a subsoil of clay are excellent. The preparation of the seed bed should be thorough, deep and firmed by rains.

Planting.—The Louisiana Experiment Station says that "planting should be done by some of the excellent and cheap cotton planters now to be everywhere found, since only a machine will give an even and straight stand which so facilitates subsequent cultivation. It furthermore economizes the seed, a point of great importance when the true value of this article as a manure and foodstuff is appreciated."

Cultivation.—When the cotton is first plowed, the shovels are set for fairly deep work both to disturb the soil and eliminate the weeds, but afterwards the soil is worked as shallow as the land allows. The aim is to avoid breaking the roots of the plants. After heavy rains the soil should be stirred and during dry weather a shallow cultivator run so as to form a mulch for holding the moisture of the soil. Cultivation should be by hand as little as possible, as hoeing adds greatly to the cost.

Planting usually takes place in the latitude of Louisiana in April. The practice of planting late and forcing the crop by high fertilization is not to be advised, though the advantages claimed by this means are that a thick crop of grass is avoided and there is less cost for cultivation. It may be taken as a general rule poor land should be planted early and rich, moist land late.

The usual distance for the plants is 3 to 4 feet between rows, plants 12 to 18 inches apart in the row. Greater distance is given on very rich soil.

Fertilization.—The elements to be added to the soil are the following, arranged in the order of their importance. (1) Phosphoric acid; (2) nitrogen; (3) potash. When all of these elements are found in one fertilizer in the proper proportions the best results are had with cot-

ton. The ingredients should be mixed in the following proportions: one part of nitrogen and one part of potash to three and one-third parts of phosphoric acid. From 200 to 400 pounds of the mixture should be used per acre and should be drilled in, not broadcasted. The barnyard manures are excellent for the soil. For green manure the cowpea is an excellent crop when turned under.

Harvesting.—Cotton is picked by hand, though some machines have been invented which do the work fairly well. Fields are picked over from two to four times, the season being about 2 to 3 months. Growers are working to shorten the season by breeding more rapid fruiting and maturing varieties.

Varieties.—Two species are common in the southern states: the upland or short-staple cotton and the sea island cotton. Upland cotton has a flower white or cream-colored when first opening, later becoming reddish and on the third day falling. The boll left after the flower falls develops to the size of a hen's egg, when it splits, liberating the seeds and fibrous wool. Sea island cotton yields less per acre than the upland cotton but the lint finds a better market as it is longer and the quality is better. It is grown along the coast from South Carolina to Florida and on the adjoining islands. Like corn, there are a large number of varieties of cotton. The following list gives some of the upland varieties that are grown: Dixon's Improved, Beck, Peerless, Sure Fruit, Cochran Prolific, Texas Storm Proof, Texas Oak, Griffin Hawkins, Mell Cross, Peterkin, Truitt, Schley, Moss' Improved, Russell, Big Roll, and many others.

Uses.—Cotton is used in the well-known manufacture of cotton cloth, the seed being used for the manufacture of cottonseed oil and meal. A ton of seed yields from 40 to 45 gallons of oil. The meal of cottonseed ranks as one of the best feeds in use for stock and also as an excellent fertilizer.

Enemies.—Anthracnose is a fungus affecting the leaves, stems and bolls of the cotton plant. There is no known remedy for this pest.

Root-rot.—Is a fungus which attacks the cotton plant and a large number of other plants and trees. It is best treated by rotation of crops.

Leaf Blight.—Sometimes attacks the leaves, blackening them and destroying them. No remedy can be recommended.

Boll-rot.—Is one of the diseases for which there is no treatment, attacking the bolls, seeds and lint.

Damping off.—In which the plants affected usually fall, manifests itself as a brown area on the stems just above the roots.

Wilt.—Is shown when the interior of the stem is brown instead of white. This disease attacks other field and garden crops such as the cowpea and watermelon. There is no treatment, but seed should be obtained from healthy plants which have grown on infected ground as it is afterwards immune to the ravages of this pest.

There are a large number of insects attacking cotton. The following do most damage: The cotton worm is a caterpillar infesting the field during the summer, and becoming more numerous during the last of the season. The remedy is to distribute Paris green powder over the plants so as to dust them with it.

The Boll Worm, the corn ear-worm and the Tomato Fruit Worm are all the same species. In addition to cotton, corn and tomatoes, it feeds upon many garden plants. Frequently several days are passed in searching for a boll and it is during this stage that the insect may be destroyed by arsenical poison. The best means of fighting the boll worm is by the intelligent rotating of crops. Entomologists advise, when planting cotton, that five rows for every twenty-five be left vacant. In these five rows at the earliest possible time one row of early-maturing sweet corn is planted. During the silking period frequent examinations are made as to the number of boll worms. As soon as the fresh white eggs are found each morning the silk ends of the corn are cut away and destroyed; then the plants themselves are destroyed and three more of the rows are planted to dent corn so as to bring the silking period about the first of July or a little later. The eggs on these rows should mature as the worms destroy each other and be destroyed by their enemies; those escaped, however, will be trapped if the fifth and last row of the vacant strip be planted to sweet corn at such time as to reach full silk about Aug. 1. This last row should be carefully watched and the corn cut and destroyed as soon as it appears that no more eggs are being deposited. Early fall plowing and breaking of farm land is the general treatment for this insect.



Transformations of cotton bollworm: 1, egg on under side of cotton leaf; 2, larva one-third grown boring into square; 3, entrance hole of young larva in square, with excremental pellets at edge of hole; 4, nearly full-grown larva just issued from boll; 5, full-grown larva on leaf stem; 6, pupa shown in center of underground earthen cell; cell shown in longitudinal section; 7, adult moth, light variety; 8, adult moth with dark fore wings; 9, adult moth in resting position, wings slightly elevated.

The Mexican cotton boll weevil is a most important enemy. This weevil is of chocolate color, issuing in early spring from its winter quarters to feed upon the young cotton. The eggs are laid in the young squares or fruit. When the larva hatches it begins to feed at once on the boll. Having the crop mature early in the season and then chop, plow up or burn the stalks before frost is the most practical treatment for this insect. Wilcox and Smith recommend the following:

"Lantern traps are of little avail in fighting the Mexican cotton boll weevil. Reliance should be placed on extermination by cultural methods. Trap crops of early cotton may be planted about gins and seed houses, and these crops thoroughly sprayed with arsenical poisons for the destruction of the weevils in the spring. The weevils may also be jarred from the trap crops into pans containing kerosene or some adhesive substance. Infested squares may be recognized by their flared appearance and may be picked off and destroyed with the enclosed grubs. Many infested squares fall to the ground and may be gathered and burned or plowed under deeply. Since cotton seed is often infested with weevils, it may be well to fumigate it as it is ginned with carbon bisulphide, using 1 pound for 25 to 50 bushels of seed. Since cotton keeps growing and producing squares until severe frosts occur, it will be advantageous to allow cattle in the cotton fields late in the fall to eat the late squares which will be infested with weevils. The remaining stalks may be cut down and piled in windrows, under which the weevils will hibernate, and this material may then be burned. Spraying may be adopted as supplementary to the cultural methods for combating this weevil. The arsenical poisons are recommended, a strong solution to be used for trap crops."

CRAB GRASS:

The most common grass in cultivated ground, making its principal growth late in the summer, after other crops have been harvested or laid by, and so furnishing a large amount of hay with no expense save that of harvesting. Although not often on the market, crab grass furnishes more forage for home use in the Gulf States than any other grass. When oats, melons and other early crops have been harvested it will soon cover the ground, and by October will often make a yield of a ton per acre, while in the pine woods and coast regions it will make nearly or quite as much on land from which corn has been harvested in August.

COWPEA:

A leguminous plant cultivated in the South for at least 150 years; in the relationship and habit of growth, really beans and not peas; annuals, closely related to the lablab, lima, and haricot beans of our gardens.

Varieties.—Cowpeas occur in every gradation of habit, form a compact, stocky, upright bush having single stems a foot high with very short lateral branches to those with trailing runners growing as flat upon the ground as sweet-potato or melon vines, the prostrate stems 15 to 20 feet in length. The pods vary from 4 to 16 inches in length, and the peas are of every imaginable shade of white, yellow, green, pink, gray, brown, red, purple and black, of solid colors or variously mottled and speckled, and of varying sizes and forms, from large kidney-shaped to little round ones smaller than the garden peas. There is a like variation in the length of time the different forms require to ripen seed, some requiring 8 or 9 months, a few ripening in 60 days from the time of planting.

Cultivation.—Cowpeas are planted broadcast or in drills, very commonly in the South, between the corn rows after the crop is laid by. The amount of seed used varies from 4 quarts to 2 bushels per acre, the average amount being perhaps about 3 pecks. If sown in drills 18 to 30 inches apart, less seed is required than when sown broadcast. The seed will stand being covered to the depth of 2 or 3 inches, but care must be taken to plant when the ground is neither too wet nor too cold, as the peas rot rapidly under such circumstances. Where the vines are grown for hay, the yield will be larger if the seed is planted in drills and cultivated a time or two.

The vines should be mowed for hay when the peas are well formed and the leaves and pods are first beginning to turn yellow. After wilting on the ground or in windrows from 24 to 48 hours, the hay is placed in small thin piles, or cocks, and allowed to cure for several days, when it may be carted to the barn or stacked under sheds. Another method is to stack the vines in a pen or rack of rails or poles so arranged as to allow the air to enter every part of the pile. This stacking over poles is best where the vines are pulled, or where the trailing or creeping sorts are used.

In the Gulf States cowpeas will give an average yield of 2 to 3 tons per acre, while 4 to 6 tons are not uncommon. Farther north the average will range from 1½ tons in Ohio

to 2½ tons in Arkansas, Missouri and Tennessee. North of the latitude of the Ohio river it is chiefly valuable as an addition to the list of drouth-resistant, soiling crops and as a crop that will yield a considerable amount of forage on soil too sterile to grow red clover.

Harvesting.—The majority of farmers harvest only enough seed of cowpeas to plant again the next season. The ripe pods are picked by hand and are stored in barrels until needed or are threshed out by machine or with flails on the barn floor during the winter.

Feeding Value.—The feeding value of cowpea hay is very high, as shown by feeding tests and chemical analyses. Green cowpea vines are more succulent than red clover or any of the grasses, containing less dry matter per total weight.

When cowpeas are planted for green manure, it is an excellent practice to turn hogs into the field about the time the first peas are ripening. Young pigs thrive on the succulent foliage and well-filled pods, and the quality of the pork on such a healthful and nutritious diet is extra good. This is a profitable method of fattening hogs or preparing them for topping off with corn for market. An acre of ripening cowpeas will pasture from 15 to 20 hogs for several weeks.

CRIMSON CLOVER:

This annual clover is of comparatively recent introduction into this country, in many sections having hardly passed the experimental stage. It thrives best on warm, loose, sandy soils, and does not make a satisfactory growth on stiff or wet and poorly drained clays, nor on any of the heavier classes of soils. Its chief value is as a winter and early spring pasture crop and as green manure. The seed should be sown alone at the rate of 15 pounds to the acre about the middle of July or the first of August in the Middle and New England states, or later farther South. Farmers have been more successful with it in the South than where the winters are severe.

FLAX:

A common, flowering plant grown for its oily seed and fibrous stalks; one of the standard crops of the United States, grows in all the northern states. Instances are common in the Dakotas (on low-priced lands) where one year's crop will be greater in value than the land upon which it was grown. Until late years but little attempt

was made to save the fiber, but at present tow mills are found in many flax-raising districts.

Soil.—A moist, deep, strong loam upon upland will give the best results. Barley lands in the middle states and new prairie lands or old turf in the western states are frequently used. Weedy soil should always be avoided. Fall plowing with cross plowing in the spring if the land be heavy is to be recommended. The soil should be harrowed until it is as fine and even as possible, all lumps and clods being broken up. Flax is commonly called "hard on the ground" and except in the new lands of the west the same land is not cropped with it for more than one year.

Sowing.—Flax is usually sown on breaking or corn ground. Early in May or when the ground is settled and warm, is the usual time in the north. Two or 3 pecks of seed per acre is sown; one and one-half to two bushels per acre is required to produce fine fiber. Broadcasting is the common method of sowing; drilling is sometimes practiced where seed only is wanted.

Care.—Flax requires no attention unless weeds are present in the stand. Mustard is one of the common weeds found in flax fields, and must be pulled and destroyed.

Harvesting.—Flax for seed is generally cut with the binder, occasionally being bound. Sometimes the binding apparatus is removed and the cut grain allowed to trail on the ground. It is not often mowed unless the weather is damp enough to prevent shelling. Thrashing is done with an ordinary machine. Flax grown for fiber may be pulled by hand or cut close to the ground, by machine, the first way being the more common.

Yield.—Eight to 15 bushels is the common yield, and will bring an average price of \$1 to \$1.25.

Use.—The manufacture of linseed oil consumes most of the crop grown for seed, the residue—linseed meal—being used as a stock food. The straw is used for bedding, banking and is often burned, as stock will not eat it.

Diseases.—Flax wilt is a fungous disease attacking the plants at different times, causing them to wilt suddenly. Disease is introduced through the seed. It is best met by rotation of crops, though the seed may be cleansed by treatment with a solution of formalin, 1 pound to 45 gallons of water.

FOXTAIL MILLETS:

By far the most important group of millets grown.

Varieties.—Common millet is the most widely cultivated of the foxtail millets, being the hardiest, and enduring drouth the best and giving best returns on poor soils. It is the one of the earliest of the foxtail millets, and is the most constant in its characters.

German millet has been in general cultivation in the south since the early seventies, making a heavy yield of forage under favorable conditions, but does not stand drouth so well as the smaller varieties, such as the common millet and Hungarian.

Hungarian, by most farmers, is placed next to common millet as a hay crop, the quality being regarded as better than that of German millet.

Seeding.—Seeding is generally done during the latter part of May or early June in the North, and correspondingly earlier in the South; or, if the moisture conditions are favorable it may be delayed as late as Aug. 1 in the latter region, the general rule being, however, to sow millet as soon as corn is planted. It is often put in as a catch crop when corn has failed or been destroyed.

The seed may be sown broadcast or with a grain drill. There is but little choice between the two methods. One-half to three-fourths of a bushel of seed per acre for a crop of hay and somewhat less for a crop of grain, is sown.

Harvesting.—Cutting foxtail millets for hay should never be delayed until the seed has begun to ripen. The hay may be safely cut any time during the period from complete "heading out" to full bloom.

One of the best methods of curing the hay is to allow the grass to lie in the swath until partially dry, then gather into shocks and let stand until thoroughly cured, after the manner of curing alfalfa and clover. Hay cured in this way is of better quality than that allowed to lie in the swath exposed to the sun until dry.

HOPS:

Twining plants of the nettle family, the floral parts of which furnish the substance giving the characteristic bitter taste to beer. The Pacific states and New York supply the greater part of the crop, though Wisconsin, Minnesota and Michigan produce a small amount.

Soil.—Where the country is new as in Oregon and Washington, any mellow soil will produce good hops without fertilization; in the well-cropped lands of the east well

rotted stable manure must be applied in quantities to secure a profitable crop. Sandy loam is considered the best.

Propagation.—Root cuttings 4 to 8 inches long are used to propagate the hop vine. Planting takes place early in the spring. Two or three cuttings are spaded or heeled in, in rows 7 feet apart each way, these cuttings being about 8 inches apart. Except in California or similar warm climates there will be no crop the first year. As there is considerable waste space this may be utilized by planting it to potatoes or some other low crop. California vines yield well the first year, the second year being the best. Ten years is the average paying life of the vine.

Pruning.—It is necessary to prune the roots of the vines every year. This is done by exposing the roots to a depth of 3 or 4 inches, removing an inch of the old crown, cutting off and removing the surface runners as well as the dead part of the vine stump which was cut off at harvesting time.

Training.—There are two methods of training: the pole and the trellis method. In the first, the vines are trained on one or two poles 15 to 18 feet long; in the second, the plants are trained upon wires let down from the tops of poles.

Picking.—Hops are picked when the seed becomes hard, the point of the cone closing up, the hop feeling hard and solid to the hand and rustling when touched. The vines are cut down for picking. The hops being then cured or bleached for market.

After bleaching and going through a sweating process hops are put up in bales of about 200 pounds. There is a wide range in the market price of hops, sometimes selling as high as \$1 per pound and as low 5 cents.

Expenses.—Hops cost about 12 cents per pound to grow. It costs above \$100 per acre for roots, planting, trellis, while a kiln taking care a 50 acre crop will cost not less than \$3,500. Drying costs about 80 cents per 1,000 pounds; shipping, \$15.

Diseases.—Mildew, which may be treated by dusting with sulphur or spraying with fungicides, sometimes occurs. Hop grubs, leaf hoppers and caterpillars also attack the vines. Spraying is usually practiced for their removal.

KAFFIR CORN:

A close-growing, leafy, more or less branched plant with very compactly flowered heads. Three varieties are at present in general cultivation—red, white and black-hulled white. These varieties differ chiefly in hardness and in the character of the seed and hulls or glumes.

Kaffir corn is especially valuable for its ability to thrive to thrive on a great variety of soils and under conditions of drouth that would be fatal to corn, readily reviving with the coming of rain. The leaves remain green and fresh until after the grain ripens, so that it is possible to harvest a good crop of seed and also one of forage of good average quality.

Under ordinary conditions about 6 pounds of seed will be sufficient to plant one acre of land. The preparation of the soil, methods of cultivation and subsequent treatment should be essentially the same as that given to the common sorghums.

The seed of Kaffir corn is of much the same composition as Indian corn, and may be substituted for it as stock food to good advantage, although not having quite as high food value.

OATS:

A collective name for common cereal plants or their seed, grown as food for domestic animals and to a limited extent as food for man throughout the temperate zones.

Oats forms one of the most important crops grown in the United States, being second in number of bushels raised. Of all the cultivated cereals oats are the most hardy and are grown in every state in the Union, and as far north as Alaska.

Soil.—The best soil for oats is a clay or clay loam, fertile and well-drained, though the crop may be successfully grown on almost any soil. Better results are obtained from plowing than from disking in, though oats are usually disked or harrowed in without plowing when following corn. In the northern states fall plowing has proved to be the best for oats, while farther south, spring plowing seems to be the most favorable.

Seeding.—The seeding time of oats, like that of other grains, depends upon the locality. In the south, oats may be sown in the spring or in the fall, while in the north, oats are seeded as soon as the frost is out of the ground.

To secure the best results seed should be sown about 2 inches in depth, though they may be sown as deep as 3 inches without danger. From 2 to 3 bushels per acre is usually put in. Oats are usually sown alone, though mixed with wheat in the north or with peas in the south. A common mixture of peas and oats is one-half bushel of the former to two bushels of the latter. When grown for hay the same ground may be cropped in the fall with rape for sheep. Drilling and broadcasting are both practiced for oats, the latter being by far the more common.

Harvesting.—Harvesting should begin when the lower part of the stalk is turned and commences to show yellow. The straw is better at this time and there will be no loss from shelling as is common when harvesting is delayed. One of the faults of heavy growth of oats is lodging. Rolling has often been tried to remedy this. The oats are rolled when they are from 8 to 12 inches high, after which they stand up better.

Varieties.—There are two classes of the ordinary species of oats called branching oats and side oats. Besides this distinction there are also white, black and red oats with intermediate colors. The hullless variety of oats is sometimes grown but is not as good a yielder as other kinds. Among the many varieties of oats giving heavy yields are Lincoln, Monarch, Wide Awake, Welcome, Clydesdale, American Banner and New Zealand.

Value for Feeding.—Oats are considered most valuable for horses, being a well balanced ration. For growing young stock and for breeding hogs or sheep this grain is unexcelled. Milch cows do very well on oats either ground or unground. For hogs they should be ground, and if possible, mixed with cornmeal.

Enemies.—The most important diseases of oats are the smuts. Wherever the grain is put in, loose smut will often be found. The disease is carried by the seed and the seed must be treated. To prevent smut in oats the seed should be soaked for two hours in a solution of formalin, having one pound of formalin to 50 gallons of water. Another remedy is that of soaking the seed for one day in a solution of potassium sulphide, 1½ pounds to 225 gallons of water. Or the seed may be placed in a common gunny sack and immersed in a kettle of water heated to 136 to 138 degrees F., agitating the contents for 5 minutes; remove and sow by hand. Seed free from smut is had from the resulting crop.

The grain must be thoroughly wetted in treatment, otherwise it is not affected. Besides the various smuts rust attacks oats the same as wheat. Other diseases are not common. Oats are subject to the same insects as is wheat.

ONION:

Common garden and field plant, grown for its bulbous root and much used as an article of food. Onions commonly are grown from seed, though a small portion of the crop is produced from sets or tops and from potato onions. Sets are small onions; tops are the small bulbs which grow on top of the plant, while potato onions are those bulbs which are made when the original bulb is divided.

Soil.—Cool, rather moist land, preferably level, containing an abundance of quickly available plant food and well drained, should be selected for onion growing. It is essential that the soil be in the best possible tilth at seeding time, so that the young plants may not be handicapped in their early efforts to secure a good "foothold."

It is best to prepare onion land the previous fall, thus allowing the surface to become weathered. A disking or several harrowing in the spring will put the soil in suitable condition for the reception of the seed. Heavy applications of barnyard manure made a year before the plowing of the land for onions give important increases in yield. Land which has been in clover for a few years and has not been severely cropped makes a very satisfactory onion soil. Where barnyard manure is applied the same year the seed is to be sown it should be well rotted. It is not advisable to apply coarse raw manure just before sowing. Commercial fertilizers are usually to be preferred, as the plant food in them is more readily appropriated. Wood ashes as a top dressing applied in the fall, but preferably in the spring, improve the texture of the soil and augment the supply of available potash and phosphoric acid. Exceedingly careful treatment of the surface soil is required in successful onion culture. The crop is not difficult to grow if the conditions are right.

Seeding.—The seed should be sown as soon in the spring as the soil is in proper condition. Early seeding is necessary in order that the plants may become established before the dry, hot weather of summer. Onions revel in a cool season. These are sufficient reasons for early seeding. In ordinary garden practice the seed is sown in

rows about a foot apart, often in "beds," 20 to 30 seeds being sown per linear foot. Hand seeding is practiced. Commercial onion growers, however, use hand seed drills, of which there are several successful types. In New York state, Ohio, Wisconsin, Colorado and in parts of several other states onion growing is an important industry, and in recent years marked progress has been made in the machinery utilized in handling the crop. To avoid hand labor and thus reduce the cost of production has been the aim of growers. Those who make a business of growing onions are particular to secure the best quality of seed, as a good stand is half the crop, and plant in rows as straight as they can be run. These rows are usually about 14 inches apart. About 5 lbs. of seed per acre is required. If the soil has been well prepared, free from clods and well fined three or four inches down, the plants will become established under favorable conditions, and if the necessary plant food is available rapid growth will be made.

Cultivation.—Cultivation should be persistent. At the outset hand wheel-hoes are used. One-horse weeders are employed after the plants have attained considerable growth. If the land is inclined to be weedy the onion field will usually require to be weeded by hand once or twice during the season. To avoid this, land for onions should be the cleanest to be had. Commercial growers do not practice thinning the plants; they rely on the seed drills to distribute the seed so that thinning will not be necessary. Cultivation should be continued until the crop is "made." Tillage which merely skims the surface and maintains a dust mulch is best. Hand hoeing often becomes necessary where a foul piece of land has been selected.

Harvesting.—When the tops die down the crop is ready to harvest. This is done by pulling the onions out by hand and throwing several rows together in a small windrow, in which they are allowed to cure for three or four days. If a special market is catered to, however, it is often advisable to cure the onions in a cool, dry place under cover, in a loft for example, where the tubers are spread in a thin layer over the floor. After they have cured the tops are clipped off with a shoe knife or strong shears, cutting them off about half an inch about the bulb. There has recently been invented an onion topping machine which is practical and used extensively by large growers. The tops should be cut off clean, but care should be taken not to injure any of the live tissue of the bulb itself. Some growers remove the tops before the onions are harvested,

as this expedites the work. When stored they must be clean and perfectly dry.

If the crop is uneven, as usually is the case, it is best to grade the tubers. The work will pay in better prices received on the market. They are graded by passing them over a rack with a slat bottom, the slats being placed such distances apart as to allow the large onions to pass over and the small ones to drop through the meshes. The rack is placed in a slanting position so that the tubers are easily worked toward the lower end into barrels. Put them in a frost-proof place where absolute dryness is assured. Winter onion houses in the north are usually provided with heat. Freezing does not injure mature onions if they are allowed very gradually to thaw. They may therefore be stored in the loft on the north side, where the sun does not strike the roof, and covered several inches deep with loose hay or straw. In the spring the covering is removed and the onions slowly thaw. This method can be practiced with safety, however, only where the winters are comparatively uniform in temperature; at least where violent fluctuations in temperature do not occur. Most commercial growers prefer to sell the crop in the fall, and have occasion to use only temporary storage. For this purpose an open shed, constructed much the same as a corn-crib, is used. The floor is a few inches above the surface, with spaces half an inch between the planks, the sides of the shed being composed of slats. If the onions are dry and clean when stored away they may be placed several feet deep in this crib. Proximity to large markets and proper facilities enable growers to realize handsome profits from onion growing. A good crop is 300 to 400 bushels per acre. More than 750 bushels are often grown on an acre.

The large red Wethersfield is a good cropper in the north, while for outdoor seeding the Yellow Globe Danvers is a favorite. There are many other varieties adapted to different conditions.

Enemies.—Smut is often found on the young plants, to be treated by transplanting, or applying a mixture of sulphur and lime in the drill when the seeds are put in.

Cutworms are common enemies of the onion as well as other plants. See treatment under Corn.

POPCORN:

A small eared variety of corn, the kernels of which expand greatly or pop under the application of heat. There are two varieties of popcorn: one has a kernel resembling flint corn; the other is rice popcorn which has

a sharp pointed kernel. Popcorn is grown the same as field corn and should be planted about 80 rods from other varieties of corn or it will cross with them. The corn pops best when two years old. The diseases and insects affecting popcorn are the same as those described under corn.

POTATO:

Common field and garden plant, or one of the tubers borne by the plant; about 200,000,000 bushels are grown annually in the United States.

Soil.—A rich, sandy loam well drained and well supplied with vegetable matter is best. Stiffer land may be improved by green manuring and drainage, and lighter soils can often be made sufficiently rich by the addition of green manures and fertilizers. Newly cleared land is excellent, giving a good yield.

Potatoes should be alternated with other crops to prevent scab. Barnyard manure is the best fertilizer, but should be applied to the ground a year or two before the land is cropped to potatoes. If commercial fertilizers are used, a mixture containing nitrogen in form of nitrate of soda, phosphoric acid as superphosphate and potash as sulphate, and in which potash is strong, is recommended. Preparation of land should be deep and thorough.

Planting.—Planting without ridging generally affords the larger yields, but a stiff soil and the desire for an extra early crop sometimes calls for ridge planting. The best time for planting depends upon the local climate. It should be so timed as to bring the period when the tubers are rapidly forming, at a date when there is a good average rainfall. Planting is done by machine, dropping by hand and plowing in or covering with a hand hoe. Rows should be 3 feet apart and the seed pieces 16 to 18 inches apart in the row. On mellow, well-drained soil, deep planting (3 to 5 inches) is best, especially when the season happens to be dry. For the early crop or on stiff soil with a tendency to bake the depth of planting may be decreased.

It is generally advisable to plant 15 to 30 bushels of seed (halved or quartered potatoes) per acre.

Seed Potatoes.—The tuber should be cut into compact pieces of nearly uniform size, the majority of pieces having two, three or more eyes.

Cultivation.—A harrow with the teeth set backward should be run over the ground just as the plants appear above the ground. This will destroy the young weeds and will not harm the plants. When the rows are cultivated they should not be hilled up, particularly if there be any danger from dry weather. The ground between the rows should be kept mellow and level, a small ridge being worked toward the hill about blossoming time.

Harvesting.—For early use dig as soon as the tubers are large enough to eat. The main crop is dug only when the vines die. Often the tubers are allowed to remain in the ground until the first light frosts. Digging is done on a large scale by use of one of several machines on the market or by means of a potato fork. Potatoes are commonly stored in the cellar for winter use or sale though well banked and covered field pits are used where the yield is large and the sale not immediate. Stored potatoes will stand 33° F., without freezing, and should be kept from warmth, which favors sprouting.

Varieties.—The following are among the most widely known varieties:

Early.—Early Ohio, Early Rose, Beauty of Hebron, and Triumph. **Medium and late.**—Burbank, Rural New Yorker No. 2, Empire State, Mammoth Pearl, White Star and Dakota Red.

These are standard varieties, and though not necessarily the best, they seem to have given general satisfaction.

Double Cropping.—In the south two crops of potatoes are frequently grown in the same year on the same land. Small potatoes from the early crop furnish the seed and are usually planted whole. Second crop potatoes keep better than first crop for keeping and are popular for seed.

Diseases.—Brown rot occurs in many parts of the south, attacking egg-plants and tomatoes as well as potatoes. The vines suddenly wilt, the vines and stems turning black or brown, after which the tubers rot. Spraying such as recommended for early blight is the remedy.

Early blight, checking the growth of the tuber as soon as the plant is attacked, shows in small, gray spots afterwards becoming brown and dry, the entire leaf afterwards turning brown and curling up. Spraying with Bordeaux mixture will check its ravages.

This is prepared and applied as follows: Pour into a fifty-gallon barrel twenty-five gallons of clean water; then weigh out six pounds of crushed bluestone, or copper sul-

phate, and after tying it in a piece of coarse sacking suspend the package just beneath the surface of the water by means of a string tied to a stick laid across the top of the barrel. In another suitable vessel, such as a tub or half barrel, slack four pounds of fresh lime. Slack the lime carefully by pouring on small quantities of water at a time, the object being to obtain a smooth, creamy liquid, free from grit. When the lime is slacked add sufficient water to make twenty-five gallons. As soon as the bluestone is dissolved, which will require an hour or more, pour the lime milk and bluestone solutions together, using a separate barrel for the purpose and stirring constantly to effect a thorough mixing. It sometimes happens that sufficient lime is not added, and as a result the foliage may be injured. To be certain that the mixture is safe, hold a steel knife blade in it for two or three minutes, and if the polished surface of the blade shows a copper-colored tinge add more lime, but if it stays bright the mixture is safe to use. Application of the mixture should begin when the plants are four to six inches high, and should be repeated at intervals of twelve to fourteen days until five or six treatments have been made. By adding eight ounces of Paris green to each barrel of the Bordeaux mixture a combined fungicide and insecticide is obtained, and this will prevent the attacks of the Colorado potato beetle, the flea beetle, and other insects. Before adding the Paris green it should be mixed with a small quantity of water, and when a thin paste is obtained this should be thoroughly stirred into the barrel of Bordeaux solution.

Scab, a fungous growth affecting the tuber, is often found after heavy applications of stable manure. A mixture of 8 fluid ounces of commercial formalin (40 per cent formic aldehyde) with 15 gallons of water, used as a dip for seed potatoes is the best remedy.

Late blight, attacking the leaves, stems and tubers, is a rapid-spreading disease which should be treated the same as early blight.

The Colorado potato beetle is one of the most common pests, the striped beetles and their reddish larvæ being familiar to every farmer. In gardens they are sometimes gathered by hand and destroyed by burning or with kerosene. In the field, Paris green or London purple mixed with flour or plaster or in solution for spraying is the common remedy.

The stalk weevil, an ash-gray beetle sometimes infesting the potato, may be destroyed by spraying.

The potato worm of the Pacific coast which bores in the stalk, later working down to the tuber, may be destroyed by burning the tops as soon as possible.

Blister beetles, so named from the irritation produced on the skin when encountered, attack many cultivated plants as well as potatoes. Arsenical poisons are fatal to them or they may be destroyed by knocking off into water having kerosene on the surface.

Many other insects attack the potato, such as various wire worms, beetles, etc.

RAPE:

Rape is especially relished by sheep and swine, yields heavily, is very succulent, and will continue to grow until freezing weather. It grows best in a cool, moist climate, but is quite resistant to drouth. Dwarf Essex is the most reliable variety.

If land is not rich, manure well and prepare thoroughly as for a root crop. Drill with a grain drill, stopping two out of every three holes. Seed at the rate of five pound per acre. Cultivate with a harrow or weeder when plants are young. This crop starts quickly and grows rapidly, and will soon shade the ground and keep down weeds.

It is sometimes seeded with the spring varieties of small grain. In such cases seeding should not take place until the grain is well up, lest the rape get the start of the grain. As so little seed is required, this entails very little expense, and if the season is favorable, a large amount of feed will be produced after the grain is cut off.

Still another plan that frequently meets with success is to sow in corn at the last cultivation. The amount of feed that the rape will make in such cases will depend upon the condition of the corn growth and moisture supply. If the corn is of good rank growth, the rape can make but little feed.

RED CLOVER:

In the Eastern states this is the most extensively and commonly cultivated of all leguminous hay plants. Clover hay is the standard of excellence by which the feeding value of all other leguminous crops is measured.

Red clover is usually sown with a grain crop, so that it will cover the field after the latter has been harvested. The seed weighs from 60 to 64 pounds to the bushel, and from 12 to 16 pounds are used per acre.

See Clover for cultivation, etc.

RED FESCUE:

This perennial creeping grass grows along the Atlantic coast of the New England and Middle states, and in the Northern states, extending westward to the Pacific. A great number of forms and varieties occur throughout its range. It makes a close, fine-leaved turf, and grows well on sandy fields and dry sterile, sandy uplands. The seed weighs 14 pounds to the bushel, and it should be sown at the rate of 2½ bushels per acre alone, or a small amount in mixture with other grasses. This and orchard grass grow well in the shade and are good grasses to sow in woodland pastures.

REDTOP:

A native grass, ranging across the northern portions of the continent. In the north it is the standard grass for wet meadows. Redtop grows naturally on marshy meadows, and is best suited for cultivation in such places.

RESCUE GRASS:

This is apparently a native of the southwest, and was one of the first native grasses to be brought into cultivation. It is known as Australian oats, Australian brome, Arctic grass and Schradler's brome. Although usually an annual repeated cuttings or persistent grazing will prevent seed bearing, and so enable the plant to live several years. It grows best on rich, loamy soil, and in most localities should be treated as an annual, as it is soon crowded out by other grasses on land which has not recently been plowed.

Seed should be sown in August or September at the rate of from 30 to 40 pounds per acre.

RICE:

A plant of the grass family, of a single species, cultivated in all warm climates, where its grain is used for food and its straw for various purposes.

Varieties.—The two principal varieties of lowland rice cultivated in the Atlantic states are the gold-seed and the white rice. The principal variety hitherto planted in Louisiana is the Honduras. The Japan rice, now in process of introduction, has a short and thick kernel and a thin hull; the percentage of bran and polish is small; the straw is still green when the grain is ripe; the yield is very large. White rice is chiefly grown on lands that are low, level, and easily irrigated. There are varieties which may be grown on fertile upland without irrigation.

Soil.—The best soil for rice is a medium loam containing about 50 per cent of clay. The alluvial lands along the southern rivers where they can be drained, are well adapted to rice cultivation. The rich drift soils of Louisiana and Texas prairies have shown marvelous adaptation to rice. The best soils are underlaid by an impervious subsoil, otherwise the land cannot be satisfactorily drained at the time of harvest in order to permit the use of improved harvesting machinery. Gravelly or sandy lands are not adapted to rice cultivation.

Irrigation.—The fields range in size from 60 to 80 acres on the prairies of southwestern Louisiana down to one or two acres along the banks of the Mississippi River. The entire surface of each field should be nearly level so that irrigation water will stand about the same depth. The tract of land selected and inclosed is cut up by small canals into the fields or sub-fields, of suitable size.

Plowing.—In the South Atlantic States the land is often plowed or dug over with a hoe early in the winter. In southern Louisiana the land is so low and wet and the soil so stiff as to necessitate plowing in the water. Deep plowing is advocated by the best authorities, particularly if the soil is well drained. If it brings too much alkali to the surface the remedy is to plow a little deeper than the previous plowing just after harvest.

For dry culture the land is prepared very much as for a crop of oats.

Drainage.—Perfect drainage is one of the most important conditions in rice culture. Either tiling must be employed or the water must be controlled by open ditches, the main ones at least 3 inches in depth.

Sowing.—The seed should be free from weeds and uniformity of the kernel should be looked after. It may be sown between the middle of March and the middle of May, but in most cases should be sown about April 20 for best results, as soon as advisable after spring plowing. Where there are several fields they should be planted at different periods so that the harvest will not be crowded. One to 3 bushels is the amount per acre. Drilling is preferable to broadcasting, which is the common method.

Flooding.—Flooding is not practiced unless necessary to start the seed, until the rice is 6 to 8 inches high. The water should stand 3 to 6 inches deep and be renewed by continuous inflow and outflow. If the stand is thin the water should be deeper, and always should be of uniform depth all over the field.

Fertilizing.—Rice is not hard on the soil, especially if the straw and chaff are returned regularly to it. However, there is very little information on the subject of fertilizers as affecting rice.

Weeds and Grasses.—To every tiller of rice lands the rapid increase of injurious grasses becomes a serious difficulty, as the conditions favorable to the growth of rice are also favorable to the growth of grasses. The following methods are the most generally applied: Hand weeding is very beneficial but too slow and expensive to be generally employed. Hoeing and burning the grasses after the rice is harvested destroys them but leaves the land bare to be parched by the hot sun. Winter flooding has been attempted so as to destroy the grass by drowning it out during the winter, but has not been very successful. Early planting and mowing is sometimes resorted to, both rice and grass being mowed when they have a good start, but this materially reduces the yield of the rice. Fall plowing and harrowing or a thorough disking immediately after harvest if the weather is warm enough, is quite effective against injurious grasses and red rice. Red rice is a wild variety having red grains and causes the rice growers some annoyance and loss, as a few grains lower the grade and reduce the price; it increases rapidly. Seed must be carefully watched to see that it is free from red rice and if accidentally planted it must be prevented from maturing.

Harvesting.—Reaping machines are generally used in the prairie districts of Louisiana and Texas, but in the other rice producing sections such machines can only be used to a limited extent if at all, as the ground is not dry and firm in the harvest time. Where reaping machines cannot be used the sickle takes their place, the rice being cut from 6 to 12 inches from the ground and the grain laid upon the stubble to keep it off the wet soil and allow the air to circulate about it. After a day's curing the grain is removed from the field; it is then shocked on dry ground, the bundles braced carefully against each other and the shock carefully capped with the heads of the capping bundles falling on the north side to avoid the sun, preventing some cracked and chalky kernels. The steam thresher is fast taking the place of flailing or treading out, though its use frequently involves considerable loss through breakage and waste of grain.

Yield.—In South Carolina and Georgia the average yield is from 8 to 12 barrels per acre; in southwestern Louisiana it averages a little more.

Milling.—The rice as it comes from the thresher is known as paddy from the rough rice being the grain proper with its enclosing husk. By a complicated process these husks are separated from the grain and polished when it is ready for market.

RYE:

Common cereal or its seeds, somewhat resembling wheat; grown in the United States for its grain, used for flour and malting, and for forage purposes. Rye-straw is used in paper making. It is hardier in its habits than wheat, both as to soil and cold. It makes excellent green manure, and is often utilized as such after having been pastured. Where stock are allowed to run in cornfields after husking, a great amount of feed is saved by sowing the field to rye at the last cultivation. In the south it affords three to four forage crops for fall and winter cutting.

Soil.—To secure a large yield of grain and heavy forage a light, fertile, well-drained loam is best. When grown for grain a dryish sandy soil not too rich produces the best results.

Seeding.—For preparation of the ground see wheat, as the two are similar. If the soil be poor, rye is put in a little earlier than wheat, usually about the same time. Drilling is usually preferable to broadcasting, about 3 to 4 pecks per acre, 1 to 2½ inches deep being usually sown. Heavier seeding (1½ to 3 bushels on heavy soils or late seeding or 3 bushels for forage) is common.

Harvesting.—Rye is an early ripener, winter sorts coming to maturity before wheat. Because of the heaviness of the bundle and the slipperiness of the straw it is usually threshed from the shock. The crop is cut when the kernels are in the dough, the straw having started to turn.

Uses.—Besides the uses already spoken of, is sometimes fed to stock. For hog-feed it about equals barley, though it must be fed cautiously; for milch cows it is avoided as giving the milk a bitter flavor. The straw is practically valueless for stock on account of its coarseness.

Enemies.—Rye is subject to about the same enemies as wheat, which see.

SAND VETCH:

Sand or hairy vetch is an annual, a native of western Asia, and has been cultivated in this country and Europe for about 50

years. Seed was first brought to this country by the Department of Agriculture, and now its desirability as a forage crop has become established, and it is being cultivated each year on a more and more extensive scale, principally in the south. In the north it is seldom grown as winter forage because of the severity of the season.

SORGHUM:

A tall, slender, reed-like plant extensively grown as a forage plant and for its juice, which is used in making molasses and sugar.

Soil.—Similar to that for corn, though it need not be so rich.

Planting.—Where the land is weedy the crop is usually put in hills 3½ feet apart each way, 20 to 25 seed in a hill and covered one to three inches. Later the hill is thinned down to 6 stalks. When drilled in, rows are about three and one-half feet apart and the plants one-half foot apart in the row. It may be planted the last of May or later, after corn planting time. Weeds should be got rid of as soon as possible or they will kill the tender growing plants.

Besides being put in in rows for the cane, sorghum is extensively used in the dry parts of the south, southwest and west as forage.

Harvesting.—Cane sorghum is cut when the seed is in the hard dough. Hay sorghum is cut when the seed is about half ripe. It is put up and handled about the same as hay but must be thoroughly cured or it will spoil. It should be fed early in the winter. Ten tons is a fair yield.

Use.—Sorghum pasture furnishes an excellent feed for dairy herds, sheep and hogs. After the hay is made stock can secure a good living from the cut-over ground. The same precautions as are used in turning stock onto clover should be observed with sorghum pasture.

Varieties.—Early Amber and Minnesota Early Amber are favorite varieties in the north and west, while the Orange varieties do well in the south and southwest.

Enemies.—Blight sometimes attacks the growing plants, turning them brown and working downward to the roots. Burning the infected stalks and rotation of crops are recommended.

Smut attacks either the grain or the entire head of the plant. Head smut may be treated the same as oat smut, which see.

SOY BEAN:

One of the staple crops of Japan, which attracted little attention in this country until about 10 years ago, but is now becoming common. The crop is cultivated like corn, the seed being planted in drills at the rate of half a bushel per acre. The stems alone are too coarse to make good hay, but are covered with such a dense growth of leaves and are so prolific in fruit that the hay is prized highly, especially for milch cows and for fattening animals. The yield of green forage is very heavy when grown on good soil, and the yield of beans is usually from 20 to 30 bushels per acre.

SUGAR CANE:

The cane or plant, from the juice of which sugar is obtained. Sugar cane is grown in all of the Gulf states, Louisiana being the principal sugar-producing state.

Soil.—Any well drained soil where water is abundant produces sugar cane if the climate is suitable. The best soil, however, is a rich alluvial bottom land.

Planting.—Planting is done at various times, in the fall, early winter or in the spring, the late fall or early winter planting bringing early spring growth. This is usually preferred in Louisiana.

Depending on the locality, the rows should be from 5 to 7 feet apart, the stalks being from 6 to 12 inches in the row. To produce the plants the canes are planted in a furrow and covered, these canes sprouting every 6 or 12 inches at the node.

Louisiana cane fields are good for from one to three years, while in tropical and semi-tropical countries, as Cuba, a field lasts for five to twenty years.

Harvesting.—Before the coming of a heavy frost is the time to harvest cane, the leaves being stripped off in the field. The upper joint is also removed. The yield of sugar cane is from 10 to 40 tons per acre. Each ton of cane will yield 150 to 300 pounds of sugar. Besides the sugar, molasses may be extracted.

Sugar Making.—For the economical manufacture of sugar a large plant is necessary. It may, however, be made in small quantities by a comparatively simple apparatus.

Varieties.—There are two varieties of cane: the purple and the striped. This last is sometimes known as Red Ribbon cane. There is not much difference in the value of these

two canes. Japanese is a cane that resists cold with success and is sometimes grown in the northern tier of sugar states.

Enemies.—There has been little investigation of the various diseases and insects which attack the sugar cane.

SUGAR BEET:

A strain of common beet, which by selection has been so improved as to contain more than a normal amount of sugar.

Soil.—The most favorable soil for the sugar beet is a heavy, well drained clay loam fertile and deep. Sandy soil produces an earlier maturing crop but the quantity is not so great. Clay soils should be avoided, as the roots are unable to take hold, forcing the beet partially above ground.

Fall plowing is the best for beets, a better seed bed being furnished by the mellow soil. Beets are not particularly hard upon the land.

Planting.—As early as the seed will sprout it should be planted, usually the last of April or first of May. Drill 18 inches apart, the seed being covered about $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, depending upon the soil. When the beets have four leaves they should be thinned to about 8 inches in the row, cultivation and weeding having begun as soon as they were up. Deep cultivation should be avoided, shallow working of the soil being done about once every week or ten days.

Harvesting.—When the outside leaves droop and show yellow the beets are ready for pulling. Like potatoes, they may remain in the soil for a considerable time after ripening. Freezing does not hurt, but alternate freezing and thawing ruins the beets for any purpose, besides causing them to rot. Harvesting is done by plowing on one or both sides of the rows so as to expose the beets, when they may be removed by hand. There are also special beet pullers on the market. Twenty tons per acre is a good yield, the cost of growing being about \$40.00. Sugar beets sell for about \$4.50 a ton delivered at the factory.

Varieties.—Vilmoran Improved and Kleinwanzlebener are the two varieties which are usually grown for sugar.

Uses.—Sugar beets are valuable for stock feeding, and the residue after extraction of the sugar makes a coarse food.

SWEET POTATO:

A low, trailing vine producing esculent roots. The increase of interest in the sweet potato as an article of food

is both a cause and result of improvements in varieties, methods of propagating, shipping and cooking. The value of the sweet-potato vines and roots for stock feeding is also beginning to be understood.

Types.—General markets call for a few types and give little attention to names of varieties. For instance, New Jersey growers have created a reputation for their sweet potatoes, and now more "Jersey Sweets" are sold than that state produces.

Varieties.—Any person not familiar with sweet potatoes who wishes to plant, would do well to consult the most successful growers of his vicinity and to buy from them plants or tubers for propagation.

Soil.—The best soil for the sweet potato is a light, well-drained, but not leachy, sandy loam that will not adhere to the potatoes. If the best quality is desired, soils which have an excess of organic matter should be avoided. Excellent sweet potato lands abound on the Atlantic slope from New Jersey to Florida, in some parts of the Mississippi Valley, and in the arid regions, where irrigation is required.

Propagation of Plants.—Unlike the Irish potato, the sweet potato rarely blossoms and never matures seed in northern latitudes. At the south, pieces of the tuber are sometimes planted as Irish potatoes are planted at the north. This method is not practicable where the summers are short, or anywhere if the object is to produce an early crop, because pieces of sweet potato planted early, when the ground is not warm, are apt to rot without sprouting, if the conditions of the soil and the weather do not prove to be especially favorable. Even at the south it is expensive, and there is little to recommend it. This is the direct method.

Two methods of propagating indirectly from tubers are employed. The first and more common method is to place the tubers close, without touching one another, in a hotbed, or, later in the season, in a cold frame, and cover with two or three inches of sand or loose earth that will not bake, about six weeks before the time for setting out plants. The tubers thus bedded throw up sprouts which put out roots, and so become individual plants ready to be transplanted to the field.

The other method is to place the tubers in a bed as in the first method, only further apart, or, later in the season, in rows in the field without bottom heat or cover, and instead of separating the rooted slips from the tubers and

transplanting them, they are allowed to produce vines from which cuttings are made and set in the field.

Some planters in Delaware and Maryland take cuttings from their vines in the field in June or July and plant them to produce small tubers, which are used the next spring for propagating plants for the main crop. The product is called the "slip seed" to distinguish it from "crop seed," by which is meant the small tubers of the regular crop, which are commonly used to produce plants.

Large growers propagate their plants in plant houses heated by furnaces and covered with muslin or "plant-bed cloth." After the sprouts appear the cover is rolled up or removed in fine weather to harden the plants before transplanting.

Planting.—Where the plants are set in rows one way only, a distance of 18 inches between plants is recommended. When planted in checks for working both ways, they must be at least 2 feet apart. The only advantage of planting in checks is that it saves something in hand labor on grassy ground. For planting by hand the ground should be moist but not wet. If it is very dry, the plants should be watered as soon as convenient after planting. Men have been known to plant by hand, with the assistance of a boy to drop the plants, 10,000 plants in ten hours, but 5,000 may be considered a good average day's work.

Cultivation.—Sweet potatoes require frequent cultivation and as much hand work as may be necessary to keep them free from weeds and grass until the vines take complete possession. If the work has been thoroughly done up to this time there will be no trouble with weeds and grass later.

Harvesting.—A small crop of sweet potatoes may be thrown out by a common turning plow provided with a revolving coulter or other device for cutting the vines, but such a plow leaves many of the tubers covered and the labor of gathering them is much greater than when a special sweet potato plow is used. In large operations one of the most efficient implements for harvesting is the "scoop digger" which passes under the tubers and severs all roots, but leaves the plant, with vines and roots cut, in the same position it occupied before. The tubers remain attached to the stem and are easily and rapidly lifted out of the ground.

Yield.—Under favorable conditions, in check planting a barrel of primes from 100 hills is a good yield, or a barrel from 125 plants 18 inches apart in a row. In a good crop

there may be a barrel of seconds to every five barrels of primes, more or less, according to the method of sorting.

TALL OAT-GRASS:

This is a perennial species which grows in loose tufts and throws up an abundance of leaves and tall stalks. It is well adapted to rich upland soils and when once established is one of the best drouth-resistant cultivated grasses.

It makes its heaviest growth the second year, and thrives better on southern exposure than on cold northern ones. It may be sown alone or in mixtures with other grasses. In mixtures, the quantity of tall oat-grass should not exceed one-fifth to the total amount sown. The seed weighs about 10 pounds to the bushel.

TEOSINTE:

A rank grass often reaching 12 feet in height. It needs a long season of hot weather, a rich soil and abundant moisture in order to succeed well, and it is useless to plant it where all these conditions can not be had. If cut when it reaches 4 or 5 feet in height it makes an excellent fodder, and will produce a second crop fully as large as the first.

The seed, 1 to 3 pounds per acre, should be planted in hills 4 to 5 feet apart each way, about cotton-planting time and the crop cultivated like corn. The greater distance should be given on the richer soils.

TEXAS BLUEGRASS:

This is emphatically a winter-growing species. In favorable location it begins its growth in October, and from November to May furnishes abundance of luxuriant pasturage. It matures its seed in April and from the first of June until October makes but little growth. Owing to the difficulty of propagation it has been very slow in coming into general cultivation.

TIMOTHY:

The most widely cultivated of all the tame grasses, and timothy hay is the standard of excellence with which all other hays are compared. It is usually considered and treated as a short-lived perennial, and hence is the best grass to grow in a short rotation. However, for permanent meadow lands there are other species which continue to produce a heavy yield through a much longer period.

Timothy succeeds best on moist loams and clays naturally rich in humus, or on those which have been heavily manured. It grows in the form of loose tufts, with a few short root

leaves, so that red top or red clover is usually sown with it to furnish a heavy bottom growth of leaves.

The amount of seed sown ranges from 8 to 16 quarts to the acre when sown alone. If sown with red clover the amounts range from 6 to 8 quarts of timothy and 8 to 10 pounds of clover seed per acre. On rich and well-prepared land, which is capable of sustaining the maximum number of plants and of producing the maximum crop, a much heavier seeding should be used, ranging from 15 to 20 quarts of timothy if sown alone or from 10 to 15 quarts of each of the grasses used in mixture.

For seed, timothy should be cut about the time the head turns in color. In those of the prairie states, where the growing of timothy seed is one of the principal industries, the grass is cut with a twine binder, in the same manner as small grain, and this process has been recommended for more extensive practice, because of the greater facility with which the crop may be handled.

TOBACCO:

Cultivated throughout the temperate and tropical zones for its leaves, which possess narcotic qualities; also the leaves of the various varieties of the plant.

Soil.—The kind of tobacco is influenced greatly by the soil upon which it is raised. There is a large difference between the soils yielding tobacco, ranging from sandy pine barrens to heavy clay soils. A light sandy soil produces a delicate leaf, later coloring to mahogany or yellow, while heavy shipping tobaccos mark a growth from a heavy clay soil.

Fertilizers.—Tobacco is no more exhausting to the soil than corn. The addition of fertilizers increases the yield greatly, those most important being nitrogen, potash and lime. Barnyard manure or any green manure crop, as clover, gives the soil adapted to the raising of smoking, chewing and manufacturing tobaccos. There is a large range of commercial fertilizers used, as cottonseed-meal, dried blood, potash, wood ashes, etc.

Seeding.—Very fertile old land, if free from weeds, is excellent for tobacco, but the best ground is that newly cleared. To furnish the plants potash and thoroughly to destroy insects and the seeds of weeds, ground for tobacco is usually burned over, brush or wood being piled on the bed, being allowed to burn for some time and the fire then moved. The surface soil is then thoroughly pulverized preliminary to seeding.

One tablespoonful of seed is allowed to 100 square yards,

this giving plants enough for at least six acres. In two weeks or less germination of the seed takes place, being shown by white spots which appear on the seed. To protect the plants from changes of weather, seed beds should have a covering of thin cloth. Young tobacco plants are not at all hardy and should be treated with great care and forced by the addition of weak liquid manure. Seven or eight weeks after planting the plants may be transplanted, the field having been prepared very thoroughly. This transplanting should be done as soon as possible after the date on which the last killing frost has occurred in the locality and should be completed within a month. The distance apart varies somewhat in different localities, but a general rule is from 3 to 3½ feet apart each way. Sometimes the land is checked 4 by 4 feet in order that cultivation may be continued longer. For the smaller and finer varieties of manufacturing tobacco the checks may be 3 feet or 3 feet 3 inches square. In Cuba and southern Florida where hand cultivation is still largely practiced, the rows are made 2 feet 6 inches apart and the plants are set from 12 to 18 inches apart in the row.

There are two methods of planting: by hand or with a planter. In hand planting the plants are dropped at regular intervals by one person and placed in the ground with a dibble by another.

Cultivation.—In 10 days or two weeks after the plants have been set on the row should be hoed, later to be cultivated with a cultivator or sweep, throwing a little earth to the plant. Cultivation should be shallow. When the plants get of large size and begin to throw out buds they will be too large for horse cultivation. The field should then be kept clear of weeds and grass with a hoe.

Topping is done by breaking off the top stalk bud. This is done to retain the nutritive substance in the leaf instead of letting the plant run to head. Strong vigorous plants are topped high, and it is necessary to go over the field several times to remove the buds. In cigar tobacco districts from 15 to 20 leaves are left on the plant. When the tobacco is intended for cigar fillers a smaller number is left on. For export tobaccos and heavier types of manufacturing tobaccos from 10 to 12 leaves are left.

Harvesting.—The time when the plant is ripe and ready to cut is a matter of judgment and experience. When the leaf changes color from rank green to a yellow shade, yellowish spots appearing, it is an indication that it is time to harvest. Another test is that of folding a leaf between the

fingers; if it snaps or keeps the crease where it was folded it is ripe. Where priming is done the leaves are strung on twine or on wires. Where the whole plant is cut it is allowed to wilt for several hours. When sufficiently wilted the tobacco is hung in the barn, all the worms and eggs being removed from the leaves. Great attention is paid to the handling of tobacco in the barn and there are many different methods of curing.

Curing.—After the plant is wilted on the ground and brought to the barn it is left for about two months to cure. When thoroughly dry it is placed in piles to soften up. The leaves are then stripped from the stem and packed in 300-pound boxes where they are allowed to ferment or sweat. Different localities and different kinds of tobacco require different treatments and the reader is directed to the various books on this subject.

Varieties.—The following are manufacturing varieties: Hester White, Burling Sweet, Orinoco, Hycó. There are a large number of different varieties in cultivation in different parts of the United States.

Enemies.—Leaf spot, also known as frog-eye, affects the leaves turning them yellow and killing them. Dusting with sulphur or spraying with ammoniated solution of copper carbonate is recommended.

White speck is treated in the same manner. Stem rot is a disease affecting tobacco as in corn. Fumigation is a remedy for this, sulphur being used. Mosaic disease in which the leaves turn yellow has no known cure.

Insect Pests.—Trouble with insects begins from the time the seed is sown and continues until after the tobacco is harvested and hung in the curing shed. The flea-beetle, often found on the plants, is destroyed by means of trap crops. The boll worm, described under cotton, also attacks tobacco. The bud worm which in the caterpillar stage damages the bud to a great extent is destroyed by spraying with arsenical poison. Fine cornmeal mixed with Paris green and applied to the plants is perhaps the best remedy. A small bug sucking the sap of tobacco leaves is known as the suck fly. Trap crops and clean culture are both recommended in fighting this pest. The cigarette beetle attacks tobacco when dry, the leaf tobacco being filled full of holes and destroyed for wrappers. It is common to most tobacco factories and destroys the manufactured products. Fumigation with bisulphide of carbon is recommended to rid a factory of this pest.

WHEAT:

A common field crop or its seed, furnishing flour for

bread, and next to rice, the grain most generally used by the human race. Of the cereals grown in the United States wheat is second in acreage. It stands third in yield. It is grown—unlike the remainder of the grains—for human use, being rarely used for stock.

Soil.—The most fertile soil is required for a good growth of wheat. Rich, well-drained clays, or heavy loams offer the best opportunity for large yields. Good yields are obtained from lighter soils when properly handled or when a favorable season is to be had.

In preparing the seedbed early fall plowing is recommended as best. It should be followed by harrowing to prevent growth of weeds and keep the top soil moist if winter wheat is to be sown a few weeks later. For spring wheat the ground should be left as it is plowed until spring. By this work before seeding the yield of grain is substantially increased. The depth of plowing is important in preparing the ground for cropping, as it gives greater root-feeding area. It is of more importance to have the seedbed firm, smooth and well worked. Subsoiling is not to be advised and summer fallowing does not appear to yield any important advantage.

Wheat is grown over a wide range of territory. Methods of seeding therefore vary. In the great wheat country of the northwest plowing for the crop is done in the fall; for the most part gang plows are employed, but steam plows are common and the work is done upon an extensive scale. Disking or harrowing, or both in the spring, precedes sowing. Drills are used which cover a 10-foot strip. In some cases the old stubble is simply disked and the field reseeded. This is not a good practice. In the central states where wheat growing in the aggregate is an important industry, plowing is done in the autumn and the seed drilled from the first of September to the first week in October. It is desirable to break the land in July or August and keep it in proper tilth by occasional harrowing or diskings until seeding time. Early sowing is deemed advisable in the spring wheat regions as well as where winter wheat is grown. Wheat often follows corn, being seeded after that crop is put in the shock, or between the rows at or after the last cultivation, but this is more for convenience than for a profitable yield of wheat in most instances. However, the standing stalks serve as a protection to the tender plants in such winter wheat sections as southern Minnesota. Wheat usually follows wheat in the common practice, but in the winter wheat section it often follows clover.

Rolling land is to be recommended for light land or loose clays as in Red River Valley.

Regarding the advisability of rolling wheat lands in the extreme west, it seems that the roller should never be used only on late plowing and then with caution. This is because the rough land holds the moisture in better shape than it would if smoothed down and the dry winds have better access to it. Drilled rows usually run east and west.

Seeding.—Spring wheat should be put in as early as possible. In fact, it is the best rule to sow at a time that is held to be "early" in any section. Fall wheat should be put in from the first to the 20th of September in the northern states. The grain should be up and a good stand made, but not too rank a growth, before killing frosts come in the fall.

Drilling is the most popular and economical method of seeding. One to three inches in depth for sowing is the general rule, though the drier the soil the greater the depth is true of wheat as well as of other grains. Early seeding and favorable weather conditions call for less amount of seed than the standard amount, which is 5 to 6 pecks per acre. Late seeding or broadcasting calls for one or two pecks more. Harrowing of winter wheat in the spring is thought to be unsafe, though often profitable, as is also pasturing the wheat during the winter and early spring months.

Commercial fertilizers have never been used to any extent in either the west or the fertile Mississippi Valley. In the east, however, and in some of the southern states where the soil has become somewhat worn out fertilizers may be used to advantage.

Catch crops may be followed by wheat to advantage. Clover is an excellent crop to precede wheat, as are any of the legumes, as the soil is much enriched by the nitrogen that they bring.

Seed Bed Pointers.—Fall plow for spring wheat. Plow early for winter wheat and harrow to kill weeds and hold moisture. Disk or harrow in spring before seeding. Have the bed firm and finely prepared. Old stubble should be turned or completely covered.

Harvesting.—Wheat is ready to cut when the grain is in the dough. Where cutting is begun the field should be finished by the time of the ripening of the remainder of the grain. A field that has reached the "dead ripe" stage will lose a great deal of grain in the handling.

The feeding value of the straw depends, of course, upon the time it is cut. It is of little use for feeding if cut when the grain is ripe enough to shell easily. Wheat should be shocked in round shocks and well capped. There are advantages in threshing it early and direct from the shock, as there are also in threshing from the stack.

Feeding.—Wheat from the stack is fed very little to stock except on those rare occasions when the price is so low that it can be profitably done, or when the grain is too much damaged for market. It is not as satisfactory for fattening purposes as corn, but is well fitted for young stock. When fed it should be mixed with oats or other grain. Pigs do well on wheat meal or upon wheat and cornmeal mixed. Sheaf wheat is sometimes thrown to hogs, but is a very wasteful method of feeding. Corn is always to be recommended in the place of wheat for stock, particularly as wheat forms a pasty mass in the mouth of the animal and causes indigestion.

Enemies.—There is no treatment for rust other than rotation of crops and the burning over of affected areas.

Two species of rust affect the wheat plant: Red or leaf rust comes first and attacks largely the leaves, and black or stem rust, a later species affects only the stems.

Smut also attacks wheat. Of these there are two species, viz., stinking smut or burnt, which affects only the seeds, and loose smut which consumes the entire spike. For the latter there is no treatment, but for the former see treatment for oat smut. The Hessian fly breeds particularly in wheat, though it is also found in barley and rye and is occasionally seen in timothy and other grasses. There are two broods of this fly—spring and fall broods, besides other smaller broods, particularly in southern wheat areas. Each generation is represented by four distinct stages, (1) egg; (2) maggot or larva; (3) pupa or flaxseed stage, and (4) mature winged insect. The eggs, which are very small and pale red in color, are deposited in regular rows of three to five or more, on the upper surface of the leaf, a single female producing from one hundred to one



Head of bearded wheat attacked by smut.

hundred and fifty. The whitish maggots hatch in from three to five days, imbedding themselves between the leaf sheath and the stem, causing a slight enlargement at that point.

The fall brood works on the young wheat near the surface of the ground, while the spring brood usually attacks the lower joint of the wheat, being left on the stubble when harvesting. Various methods for prevention of the Hessian fly have been recommended. Among these are burning over the infected areas after harvesting, late seeding and early sowing of a small tract to be later plowed under. These trap or decoy plantings furnish one of the best means of giving relief to late-planted wheat. Wheats having coarse, strong stems and varieties which tiller fully and develop numerous secondary shoots, such as the Underhill, Mediterranean Red Cap, Red May, Clawson, and others, are able to resist the fly to some extent.

The small joint worm deposits its eggs on the wheat stems. It may be prevented by burning over the stubble.

The frit fly much resembles the house fly. Destroying volunteer wheat and sowing wheat late are both recommended to deal with this pest. The sawfly lays eggs in May in a hollow stem, later hatching larva which cut through the stem joint with the exception of the ground joint, which they penetrate at harvest time. Rotation of crops alone is satisfactory to ward against the ravages of this insect.

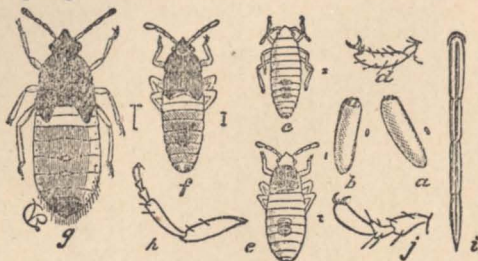
The midge deposits its eggs so that the maggots attack the wheat as soon as they are hatched. Burning the stubble or crop rotation is recommended to combat this insect.

Chinch Bug.—The chinch bug is the most important insect which injures growing wheat, the Hessian fly being second. It is widely distributed, prevails more or less every year and multiplies enormously, attacking all the cereals and most forage plants. The losses have been estimated at about \$100,000,000 for a single year. It is a native insect occurring from Nova Scotia and Manitoba southward to the Gulf. The chief losses occasioned by it are in the Ohio and Upper Mississippi Valley and lake region, and to a less extent northward throughout the Allegheny region, New England and Nova Scotia. The Gulf states do not so often suffer serious injury



except in the rice-growing regions.

The chinch bug goes through six different stages, being of damage from the time of hatching until matured. In habits it associates itself in masses on the plants attacked, preferably the lower parts. They are migratory in character, often when grain is cut, abandoning wheat fields and attacking any near-by corn or grass field. For the practical control of the chinch bug the following suggestions have been made: (1) Burning over the grass lands together with removal of rubbish in fence corners. Cultivated meadows may be burned over when the ground is frozen without injury to the grass. (2) Trap crops may be planted such as patches of millet and Hungarian grass, which when infested in the spring should be turned under with the plow. (3)



Chinch-bug; *a, b*, eggs magnified and natural size; *c*, young nymph; *d*, second stage of nymph; *e*, third stage; *f*, full-grown nymph; *g*, full-grown nymph; *h, i, j*, legs; *k*, beak through which food is drawn. (Riley).

Rotation of crops. (4) Plowing under the midsummer migrating bugs when attacking the first rows of corn. (5) Spraying the migrating bugs with a very strong oily insecticide such as kerosene emulsion. (6) The making of protective furrows as recommended for the army worm, killing the bugs by dragging a log along through the furrow or thoroughly wetting them with kerosene and water mixture.

Army Worm.—The army worm appears in the month of May or June or later, when the wheat and other small grains and grasses, except clover, are suddenly overrun by a large number of striped caterpillars of this insect. These hordes usually travel in one direction, passing from one field to another, destroying crops as they go. They also climb the stalks of such grasses as timothy and small grains, cutting off the stems just below the head.

An adult insect is a yellowish brown moth with a white spot on the center of each fore wing, laying eggs from two

to twenty in strings beneath the shreds of grass stems. These eggs hatch in from eight to ten days, the young caterpillars having a ravenous appetite.

The army worm occurs at very irregular intervals, making protective measures difficult. When a field is actually invaded nothing can be done to prevent loss. The field may be sprinkled by broadcast spreaders with an arsenical solution, or rolled, or pastured by a flock of sheep. This will not save the crop but will prevent the larva from reaching other fields. One of the best known methods is that of plowing a furrow with its perpendicular side toward the field to be protected and drawing a log through the furrow to kill the worms accumulated in the ditch.

Wire worms are often seen about the roots of wheat and other crops. Little can be done to prevent their depredations. Rotation of crops is recommended.

Seed Bed Pointers.—Fall plow for spring wheat. Plow early for winter wheat and harrow to kill weeds and hold moisture. Disk or harrow in spring before seeding. Have the bed firm and finely prepared. Old stubble should be turned or completely covered.

Breeding Wheat.—The abnormally low yields of wheat in all parts of the country can be materially increased by proper methods of selection, as well as by better methods of crop rotation and cultivation. The Minnesota Experiment Station has been a pioneer in field crop breeding, and has bred two new wheats which in that state have increased the yield



Larva of the army worm.

8 and 18 per cent over the varieties of wheat commonly grown by the farmer. By taking advantage of the individuality of the plants and planting the seeds in such a manner that the conditions for each plant are exactly the same as those for each other plant, enables a breeder to select the best-yielding ones, and having secured them, eliminate the poorer ones and give prominence to the inherited tendencies of the stronger, superior individuals. The farmer can accomplish much along the lines of breeding by saving only the best, largest and plumpest grain for seed. The fanning mill will do this work admirably.

PART II.

GARDEN CROPS.

THE VEGETABLE GARDEN:

The site should be chosen with reference to the sun and wind, one that slopes gently to the south being preferred, and with an incline a little to the east if possible. A patch of woodland or high hill is a protection from the north wind and an advantage, as is a wall or hedge well placed as a windbreak. Woven wire fence is used for keeping out the chickens.

Soil.—A light sandy loam is usually preferred, but vegetables may be grown satisfactorily with ordinary care on heavy dark soil or manured sticky red clays. A mellow rich soil which will hold moisture is easily recognized and should be chosen if available, but hardly any soil need be rejected until tried.

Size.—A quarter of an acre is considered sufficient for a family of four. If potatoes, cabbage, corn and melons are to be grown this estimate is hardly sufficient, but if these vegetables are put in the field (as they should be) usually less than half an acre will be enough, giving room for early potatoes and sweet corn.

Drainage.—Drainage must be thoroughly attended to before planting, surface drainage being secured frequently by raising the beds above the level of the ground. Underground tile drainage is usually the most economical.

Preparation of Soil.—The ground is made ready for planting by plowing, harrowing, rolling and fertilizing. Spading may be done for a small garden or for special preparation for a limited space. The rake is usually employed in finishing off the beds. The soil should be broken up fine as deep as the plant roots may be expected to go, often from 15 to 20 inches.

Plowing.—The fall is the best time for plowing if the ground be hard or full of clods or clay. As a rule two plowings will be better than one and three better than two. Spring plowing should be done as soon as the deep freezing is over and the ground can be worked. If the soil makes a ball in the hand and sticks to it it is too wet; if

it breaks hard it is too dry. For plowing it should crumble easily and finely and leave very little dirt on the hands.

Fertilizers.—There is no rule for the selection of fertilizers. It is very largely a matter of experience. Most soils are benefited by the addition of humus, a name applied to any thoroughly rotted vegetable or animal matter. The presence of humus may be determined by burning a small quantity of soil on a red hot shovel; if it gives an odor of feathers it contains humus from animal matter; if the odor of straw it contains humus from vegetable matter. Leaves, garden refuse and barnyard manure made into a compost and allowed to decay make good humus.

Seeds.—Seeds should be ready by the time the ground is prepared. It is important to have good seed and it is usually considered safe to send to some reputable dealer and depend upon him for quality.

Planting from the Hotbed.—Many vegetables, as tomatoes, and cabbage, may be started in hotbeds and the plants reset, such plants can usually be purchased of seed dealers, and enough for a small family may be started in a good-sized box of earth in a south window.

The hotbed and cold frame are easily made, all that is necessary being bottom heat, protection on all sides and a sash of glass as a cover. A pit is made for the hotbed 1 to 3 feet deep, then an inch or two stuff on the bottom and on this 18 inches to 3 feet of manure is placed; next comes a layer of leaf mould and on top 4 or 5 inches of garden loam. A hotbed with 2 feet of manure in may be expected to be good for 6 weeks. The frame faces the south and is 6 to 8 inches higher at the back than at the front.

A cold frame is about the same as the top part of a hotbed. No bottom hole is necessary and it is used for starting plants in early spring and receiving partially hardened plants which have been started earlier; it is also used for wintering young cabbages, lettuce and other plants.

Planting.—The time for the first planting in any locality is known only by experience. The following natural signs may sometimes govern the time of planting the vegetables named: The bloom of the peach denotes planting time for peas, spinach and onions; when the oak leaf breaks from its bud plant beets, turnips, corn and tomatoes; when the blackberries blossom, beans, cucumbers, cantaloupes, water-melons, squash and okra are to be planted.

The garden should be planted so as to allow cultivation

wherever possible by plowing. Wheel tools may be used where this cannot well be done. Hand weeding should be reduced to a minimum, the rows being made long and continuous for this purpose. If one kind of vegetable to make a long row is not wanted, several kinds may be put in the same row. For marking the rows for planting various devices have been used. A roller made from a smooth hardwood log with heavy ropes fastened firmly about at distances corresponding to the intervals wished between the rows may be used as a marker. When the plants or seeds are to be put in at intervals the place may be marked by knots in the ropes.

Soil.—The soil should be moist when seed is put in. If the planting is done just before a rain, it must be seen that packing of the soil over the seed does not prevent it from coming up. Most seeds are sown more thickly than the plants are desired, being thinned out as soon as the first true leaves appear, care being taken not to loosen the roots of the remaining plants.

Depth of Planting.—The depth depends upon the size of the seeds, habits of germination, early growth, the soil and the season of planting. Small weak seeds should have much less cover than large vigorous ones, while certain seeds (as celery) must be lightly pressed into the soil and have a little sand or dust scattered over them.

Transplanting.—Soon after the plants form the first true leaves they should be transplanted from the hotbed or cold frame. They should be closely pressed about the roots, and if the sun comes upon them they should be shaded with a screen of some kind. It is customary to clip back the leaves of young plants about half way from the point so as to give them better chance to root in the soil.

Rotation should be practiced in the garden, being as important there as in the field.

Cultivation.—The two principal reasons for cultivation are: (1) to keep down the weeds and (2) to maintain in the soil a supply of air and moisture necessary for the plant. One of the best methods of preventing the effects of drouth is a mulch—most frequently of the surface soil. The gardener's aim in making a mulch is to save the moisture coming up from the lower earth and send it to his plants.

Irrigation.—Irrigation should be practiced where there is a long spell of dry weather. The garden should be so arranged that it can be reached with a hose or "V"-shaped trough. The best time for watering is in the spring, in the

middle of the day; in summer, evening, and in autumn, morning.

ARTICHOKE:

The Jerusalem artichoke, in a deep, favorable loam, well prepared, will produce at the rate of 300 to 600 bushels to the acre. Two or three tubers, if small, are planted in a hill. The hills are 3 feet apart each way. Cultivation is necessary if good results are desired, but the plant will produce without any care whatever. The tubers are ready for use early in October and may be dug at any time when the ground is not frozen until late in March. Freezing does not affect them and they come to the table fresh from the earth in the early spring when other vegetables are likely to be stale and musty. They are boiled or steamed till soft and served with cream sauce; they are also used as salads or pickles. They have about the same food value as potatoes. A pint of tubers, cut to eyes as potatoes are, will plant 25 to 30 hills.

ASPARAGUS:

This vegetable is one of the earliest to be ready for use. A fertile soil is best, but any good ground thoroughly prepared does well. Fine sandy soil makes the plants gritty. Sow early, in rows three feet apart; cover lightly. Thin when three or four inches high to one foot in the row if the soil is strong; farther apart on a sandy soil. Cultivate carefully, and supply a good dressing of well-rotted manure each spring. The plant should grow vigorously. It will be ready for use in the third year, and should be cut late in June. It should then be well worked and left to grow to gather strength for the next year's crop of shoots. When the tops begin to die they should be cut and burned. The asparagus on the market is usually white, except a small tip, and the white portion is stringy and inedible. This is the result of deep setting and cutting. If the seed is planted as here directed and the shoots cut a little below the surface when two to three inches high, a dish considered by many persons to be more satisfactory will be obtained. Two and one-half ounces of seed will sow 100 feet of row. A year may be gained by purchasing the young plants a year old and setting them out four inches deep.

BEANS:

The garden beans are very tender to frost. For this reason they should not be planted until the ground has

become warmed. If the seed is sown too early it decays quite readily.

In culture, beans are divided into two types: Pole beans—climbing varieties which require support—and the dwarf, compact-growing sorts, known as Bush beans.

Pole Beans.—The Climbing Lima bean belongs to this type, and is a kind of high flavor, much prized in the South and East. It is more tender than the bush beans, however, and for this reason is not so successful in the Northwest. In that section the Dwarf Limas are more satisfactory. In planting pole beans it is best to place the poles before planting, in rows three feet each way. If the soil is thin it is a good practice to apply a shovelful of well-decayed manure under each hill. To insure a good stand, 6 to 8 seeds should be sown to each pole. Wire netting is a convenient support and in many sections is preferable to poles.

Bush Beans.—Bush beans require a very much shorter growing season, and by successional sowings may be had for table supply throughout the summer. The last planting should be made at least seven or eight weeks before heavy frost.

To secure good snap or string beans a rapid growth is necessary. Otherwise the pods become stringy. It is also necessary to keep all pods picked, allowing none to mature, for the ripening seeds will check the growth of the plant and destroy the future supply of green pods.

When grown as a field crop for market the plants are pulled by hand and piled with the roots upward, or harvested with a bean puller. If not allowed to stand until the pods shell too much they may be mowed and raked up as hay. For small quantities, a hand flail and fanning mill may be used for threshing and cleaning. By large growers, a regular bean thresher is employed.

BEETS:

Loose, rich soil with considerable sand is desirable, but beets will grow well in any except a hard, heavy clay. The seed should be planted about an inch deep in drills $3\frac{1}{2}$ feet apart. The sowing may be quite early, as the plants will stand a light frost. When growth has fairly begun thin to 6 or 8 inches in the row. The plants removed may be used as greens. Turnip or globe-shaped are liked best for summer use; the long varieties for winter keeping. Leaf blight is occasionally troublesome in beets and may be met by spraying with Bordeaux mixture.

Winter beets are sown in July and August, and after frost are taken up, the tops cut off, and the roots stored in the cellar. One ounce of seed will sow 60 to 70 feet of drill. Early varieties may be used in 50 to 60 days; the roots will be mature in 150 days.

BROCCOLI:

A kind of cauliflower, maturing late and little grown in this country. See Cauliflower for cultivation.

BRUSSELS SPROUTS:

This is a member of the cabbage family with small, lateral buds which are used similarly to cabbage. Its culture is practically the same as that of cabbage.

CARROTS:

Sow early in loose, rich soil, in rows 3 feet apart, for horse cultivator or 1 foot for the hoe. The seed is small and slow to start. It should be covered lightly and pressed down firmly. If radish seed be sown in the same row they will break the surface and mark the rows so that relief may be given if the ground should bake. Thin to 4 inches apart in the row. Carrots are considered best when young and tender, and successive growings will be necessary to supply them in that condition. One ounce will plant 150 feet of row. Carrots may be used in 70 to 120 days, varying with variety, management, etc.

CAULIFLOWER:

This vegetable deserves more general cultivation in the farm garden. It can be grown with about the same soil, planting and care as cabbage but the supply of moisture must be maintained more carefully. The plants do not stand very hot weather. When the plants begin to head the loose leaves should be bent over to whiten the center. One ounce of seed will give 1,000 to 2,000 plants.

CELERY:

A hardy, edible plant grown throughout the United States for its stalks, which, when blanched, are eaten as a relish. Besides the common method of eating raw it is used as the base for soups and as a seasoning for various dishes.

Culture.—A rich, black, loose, deep soil is the best for this plant. High land of this quality produces the best

quality of celery, but it is most grown on low lands, well drained, such as swamp lands that have been reclaimed.

Early Celery.—Early celery is not much cultivated as the later or fall crop furnishes the bulk of celery grown. In the North, to secure the early crop the seed is sown February or March and given careful cultivation. The seed is very fine, one ounce producing upwards of 4,000 plants. Seed is sown in shallow loam-boxes, these to be kept in a warm place, as in a hot-house, being broadcasted and covered with a thin layer of sand.

Celery seed sprouts slowly, taking from 10 to 15 days, and should be in a moist soil to insure germination. When the plants are large enough to bear transplanting they are first removed to another bed, giving them larger space, afterwards being transplanted into rows four inches apart, the plants two inches apart in the rows, later to be given their final transplanting to the field. They are handled at this stage much the same as cabbage plants. Field rows of celery are commonly four feet apart, the plants being separated from 6 to 8 inches in the row. In order to make the growth as stocky as possible the plants are pinched or cut back when removed to the field. Shallow cultivation is best for the plants, and early celery should always be blanched by means of tile, paper or boards instead of earth which will cause the stalks to rot.

"Self-blanching" celery matures better and produces the best results for early planting.

New Celery Culture.—By growing self-blanching varieties close together the stalks exclude the light from each other, and the common method of blanching are not necessary. Very much more fertilizer and water is required for this culture.

Fertilizers.—The ground can hardly be made too rich for celery. Unleached wood ashes and well-rotted barnyard manure furnish the best fertilizing elements.

CHARD:

A modification of the garden beet in which the midrib is used, cooked in place of the root. Cultivation is the same as for beets.

COLLARD:

A kind of cabbage, which, however, does not head but forms a branching top. Cultivation the same as for cabbage.

CRESSES:

Water cress is a kind of nasturtium used for garnishing and salads. It is a hardy, moisture-loving plant and readily establishes itself along streams after the bed has been prepared and the seed sown. There is little variation in varieties of cress.

Garden cress is a partial-season crop which is used to a limited extent for garnishing. The crop is hardy and should be sown quite early. Plants mature in from six to eight weeks.

CUCUMBERS:

A warm, light sandy soil well supplied with humus is recommended, while a hard, cold clay and any poor soil are unsuitable. Hills a foot deep and 4 to 5 feet wide should be prepared by thoroughly pulverizing the ground and mixing into it a liberal supply of stable manure and fertilizer. The only thing to be guarded against in fertilizing is the production of an excess of vine, with corresponding lack of fruit. This condition calls for pinching off the terminal buds. The hills should be 6 to 8 feet apart. Seed should be planted germ end down an inch and a half deep late in April. Weeds must be kept down carefully while the plants are young. When the vines cover the ground it is difficult to do anything with the weeds, because every movement is likely to injure the cucumbers. Many successful growers use trellises or frames.

It is best to start the cucumbers in the hotbed or in the house early in March. Sow on upturned pieces of sod 6 inches square and cover with an inch of light, rich soil. Transfer to the open ground early in May. Successional sowing should begin about the middle of May. One or two ounces of seed will plant 100 hills. Ready for use in 50 to 75 days.

CITRON:

Citron is a fruit very similar to the watermelon in appearance and culture, but bearing a thick, hard, fleshy rind, which is used for preserving.

DANDELION:

This common weed is raised commercially near large cities of the east for greens. Seed is sown in early spring in rows 1 foot apart, plants later thinned to 1 foot apart in the row. It is marketed like spinach after being partially blanched in the field.

EGG PLANT:

The egg plant, like the tomato, should be started within doors. It is even more tender than the former plant, however, and should not be planted out until the weather becomes settled and warm. Well-drained soil is important, and without this or in cool seasons the crop is likely to be a failure. The plants are usually set two feet apart in the row.

Varieties.—Black Pekin and New York Improved. There are also small scarlet and white varieties, the fruit of which is used for decorative purposes and is of little value as a vegetable.

ENDIVE:

A garden plant used for greens or for salad. Cultivation is the same as for lettuce. It may be, however, necessary to blanch it like celery. Smooth-leaved endive is large and coarse. The curled varieties, especially those having leaves naturally white, are considered the best for eating.

GARLIC:

A bulbous plant closely resembling the onion. Propagation is effected by "cloves" which resemble onion sets. Culture is the same as that of the onion.

GINSENG:

A plant growing wild in the woods of the east central states, the roots being used by the Chinese as a medicine. In order to grow this plant it is necessary that it have plenty of shade.

Seed must be treated the same as nuts used for planting, being placed in moist soil in the fall. If put in boxes of moist sand and buried in the ground over winter and summer, the seed will be ready for planting the following fall. Planting should take place in the woods or in ground given artificial shade. Rows should be 1 foot apart, plants 6 to 8 inches apart in the row, the seed being put in about an inch in depth. This is one of the few crops requiring no cultivation. Weeds, however, should be removed.

Roots should be gathered when about six years old. The average price for roots is about \$5 a pound.

GROUND CHERRY:

This plant, also known as strawberry or winter cherry,

grows wild in the cornfields of the Mississippi Valley. Its fruit is used for preserves for the table. A good soil well worked improves the quantity and quality of its production. It may be planted early in drills 3 feet apart, with 12 to 18 inches between the plants in the drill. It is recommended as very productive and as keeping through the winter in the husk.

HORSE-RADISH:

Horse-radish is a hardy perennial of the simplest culture. A rich, deep soil furnishes the best conditions for the development of symmetrical roots. Propagation is by root cuttings, which should be one-half to three-fourths inch in diameter and 4 to 6 inches in length. To insure planting them with the crown end up it is well to make the upper cut sloping. The roots are used as a condiment with meats in late fall and early spring. A winter supply may be had by storing roots in moist soil or sand in the cellar.

KALE:

A cabbage-like vegetable used as greens. It requires the same soil as cabbage, and substantially same cultivation.

KOHLRABI:

This is another member of the cabbage family, with an enlarged, turnip-shaped stem, grown considerably as a winter food for stock and in a limited way as a garden vegetable. The tubers should be used when 2 or 3 inches in diameter, as they become tough and woody when older. White Vienna is one of the best known varieties.

LEEKs:

These are a species of onion producing a straight stem. The stems are mild in flavor and are highly prized for winter soups.

Culture.—The culture is similar to that of the onion. The leek requires the entire season for growth and is stored in the green state, as in the case of celery.

LETTUCE:

This plant is the most generally used in this country for salads. A warm mellow soil is required, with plenty of water and thorough weeding. Sow as soon as danger of severe frost is past. The seeds are very small and may

be mixed with sand for sowing. They should be covered very lightly. In the Southern states it is usual to sow the seed broadcast and cover by drawing the fingers lightly through the soil, or to rake in with a light branch of a tree. The ordinary rake will cover too deeply. One kind, the cabbage lettuces, form heads naturally; the other, the Cos lettuces, do not head, but may be blanched by tying up the leaves. Lettuce may be used in 3 to 4 weeks from planting. One-quarter of an ounce of seed will sow 100 feet of drill.

MARTYNIA:

A rich warm soil is needed. Plant when frost is gone for the year in hills 3 feet apart each way. The seed is slow to come up. One good plant to the hill is enough. The seed pods will be ready for picking in 60 or 80 days and are put up in the same way as cucumbers. Half an ounce of seed will plant 100 hills.

MELONS:

Both muskmelons (cantaloupes) and watermelons need a warm, rich soil; but care must be observed not to grow the vines at the expense of fruit by improper use of fertilizing materials. Melons grow readily in a fertile sandy loam. The management is about the same as for the cucumber, but more light, heat and air are needed. The vines may be pinched back if they tend to run excessively. Muskmelons need 2 ounces of seed to the 100 hills; watermelon, 4 ounces. Muskmelons ripen in about 100 days from sowing the seed, watermelons in 120 to 140 days.

MINT:

Spearmint used for garnishing liquors and in the preparation of sauces is grown (almost without cultivation) sparingly throughout the United States in gardens. It is grown in New York, Michigan and a few other states for oil.

Propagated by root-stocks put in about corn-planting time, it is cultivated like listed corn and cut with a scythe or mower. It is then cured like hay and the oil extracted by distillation.

MUSHROOM:

A species of fungi extensively cultivated in the vicinity of cities for food, and growing wild in the woods and meadows. The edible mushroom is found in old meadows

in the spring and fall and is distinguished from other species by having pink-colored gills. A large part—often as high as 90 per cent—of mushrooms is water, and only a small part of the dry matter is digestible, being inferior in food value to potatoes.

MUSTARD:

A garden plant grown for greens and seed and often becoming a pest in field crops, particularly flax.

Cultivation.—About 8 quarts of seed are broadcasted to the acre, the crop being cut when the pods turn yellow, when it is threshed.

For garden use it is sown same as the radish, and given the same cultivation.

OKRA:

A deep, rich soil well prepared is to be desired for okra, but it makes a thrifty growth and will do well with very little care after it has a good start, unless the season is very wet and cool. The seed does not come up with much certainty, and two or three plantings may be necessary. Seed should usually be procured fresh from a dealer every year, but with intelligent handling it may be saved from the pod. Okra should be planted as soon as frost is gone, in drills $2\frac{1}{2}$ to 3 feet apart and covered an inch deep. Thin to 12 or 18 inches as soon as the plants begin to grow well.

The pods are cut 3 to 5 days after the flowers fall, and are usually boiled alone or in soup with other vegetables. One and a half ounces of seed will plant 100 hills. Use of the pods may begin in 90 to 100 days from planting.

PARSLEY:

This is a biennial. Deep rich soil made very fine and mellow is best. Sow early in the spring in drills half an inch deep and a foot apart. Thin to 6 inches in the row, when the second pair of leaves appear. If wanted in early spring parsley may be sowed in September in a moderately fertile soil. During the cold weather the plants should be covered nearly to the top with leaves, held in place by brush. One-fourth of an ounce of seed will sow 100 feet of drill.

PARSNIPS:

This vegetable is grown precisely as the carrot. It may

be left in the ground all winter and dug as wanted. It is considered sweeter and better when managed in that way. One-fourth of an ounce of seed will sow 100 feet of drill. The roots are ready for use in 140 days from planting.

PEANUT:

A trailing, straggling annual growing from one to two feet high, with thick angular pale green hairy stems and spreading branches, having a habit of maturing its fruit under ground. Virginia, North Carolina and Tennessee produce a large part of the peanut crop.

PEAS:

Frost is not so fatal to peas as to beans and the sowing may therefore be earlier. The soil, planting, and cultivation are practically the same as for beans, but peas require a better soil and more attention. Some of the best peas grow tall and require sticks or wire to hold them off the ground. The half dwarf kind may be planted in close rows so that they will support each other. The seed does not come up with quite so much certainty as beans and the plant seems to suffer more by accidents and disease. Mildew is probably the worst enemy and is treated with Bordeaux mixture. Weevil in the seed may be killed by soaking for an hour in a solution of an ounce of copper carbonate and a little less than a pint of ammonia to $1\frac{1}{2}$ gallons of water. If peas are wanted for several weeks successive sowings must be made or varieties judiciously chosen.

Two distinct kinds of peas are known, smooth-seeded and wrinkled-seeded. The latter are earlier and last longer; the former sometimes have edible pods and are known as sugar peas. One pint of seed will plant 100 feet of drill. Ready for use in fifty to ninety days, according to variety.

PEPPERS:

The plants may be started in the hotbed or sown directly out-of-doors after the weather becomes warm, and thinned to 12 inches apart. A variety collection of peppers shows a most interesting variation in size, shape, and color. The seedsmen's general list of standard varieties is quite successful.

PUMPKINS:

The pumpkin is a valuable fall and early winter feed

for cattle, sheep, and swine, serving as a vermifuge. It also is used in cooking.

Pumpkins may be grown with the corn crop, producing, where the stand is not perfect or where the corn does not grow large, a considerable amount of feed without affecting the yield of corn. If grown as a separate crop, the ground should be prepared the same as for corn. Plant about the same time in hills 8 to 12 feet apart each way, putting six to eight seeds in a hill. When the plants are well started, thin to three plants in a hill. Give thorough cultivation. Harvest before freezing weather and store in a cool dry place.

RADISHES:

Among the first vegetables usually sown are radishes. They require little space and can be grown indoors. A loose, rich, deep soil, better if sandy, is required. The radish should grow very rapidly and be eaten while very young. The seed is sown in rows 12 to 14 inches apart and the plants thinned to about 3 inches in the rows. The seed should be covered about an inch deep. Radishes are sometimes sown broadcast and raked in lightly. Grubs in some cases destroy the roots. The only escape is to plant in soil where the grubs have not found lodgment. Frequent sowings will be made by those who enjoy fresh, crisp radishes. An ounce of seed will sow 100 feet of drill. Ready for use in 20 to 45 days, according to kind.

RHUBARB:

The soil should be worked deeply, but the plant will grow with ordinary care upon any good ground. An open position, sheltered from east winds, is desirable. Rhubarb may be grown by sowing the seed in the spring, but it is better to use the divided roots of old plants. They should be set 2 to 3 feet apart and may occupy an otherwise unused corner. Once set, it will produce for several years with very little attention. Use begins the second season and must be discontinued in the summer in time to allow the plants to recuperate for the next year. An ounce of seed will sow 125 feet of drill.

RUTABAGAS OR SWEDISH TURNIPS:

The rutabaga is identical with the turnip in its culture, with the exception that it requires a longer season for growth, and for the winter crop should be sown four or five weeks earlier.

SALSIFY:

The planting and cultivation are the same as for the carrots, except that a little more space between the plants in the drill will be an advantage. Salsify may be left out all winter if freezing is not very severe, but it is considered better to pull and store.

One ounce of seed will sow 100 feet of drill. Ready for use in 130 to 140 days.

SQUASH:

A warm, light, rich soil, deeply worked, is best. Plenty of stable manure will be repaid by increased yield. Plant summer varieties in slightly elevated hills, 4 feet apart each way, as soon as the ground is warm. Cover seed 1 to 3 inches deep. Late varieties should be planted in hills 6 to 8 feet each way, leaving four plants to a hill. Another way is to plant in rows 12 to 20 feet apart and then to 6 feet between the hills in a row. Early beans or peas may be cultivated between the rows, to be cleared away in July. Weeds must be kept down and moisture held in cultivation. The hand hoe must be used after the vines begin to run. Seed from the home garden is likely to be crossed with cucumbers or melons and the product is unsatisfactory. One ounce of seed for summer and two ounces for the winter will plant 25 hills. The summer squash may be used in 50 days; winter squash will be ripe in 115 to 125 days.

TOMATO:

A clayey soil is liked by some, sandy by others. Deep preparation and plenty of manure will make good tomatoes on almost any soil. Too much manure on a light soil may cause the plant to run to vine. Sow the seed in hot-beds, or shallow boxes to be kept in the house, about the end of March, and set the plants when 2 inches high 3 feet apart in rows 3½ feet apart. They should not be set out till the temperature is likely to stay above 60 deg. This will usually be when oak leaves are well out of the bud.

Thorough cultivation, loosening the soil and killing the weeds, is necessary till the plants begin to spread and cover the ground. The soil should be drawn up to the plants in hills 2 or 3 inches high. Some support, as a trellis, is necessary to keep the fruit off the ground.

The fruit will begin to ripen in August, and should be picked as fast as ripe. The plant will usually continue bearing till frost, and if the full-sized green tomatoes are

then placed under a cold frame or on the cellar floor they will usually ripen. One ounce of seed will produce 3,500 to 4,500 plants.

TURNIPS:

Rich finely pulverized soil is needed. A sandy or gravelly loam is preferred. The seed may be sown quite early, as the plants are not easily hurt by frost. Sow in drills 1 foot apart and half an inch deep or sow broadcast and rake in lightly. If there should be no rain a thorough sprinkling will insure germination. The plants should stand at least 3 inches apart. Repeated sowings are necessary for a satisfactory succession in summer. White varieties are preferred for summer use.

For winter, sow late in July. A yellow kind is much liked. No cultivation is required when sown broadcast. Turnips may be stored the same as potatoes. The tops should be cut away. If covered with sand they will not wither, but may start to grow if the cellar is warm and will become pithy. Turnips mature in about two months. One ounce of seed is enough for 200 feet of drill.

PART III.**LIVE STOCK AND DAIRYING.**

BEEF:

The corn-belt is peculiarly adapted to the business of raising the best quality of beef. Modern economical methods produce beeves of 1400 to 1600 pounds weight at 1 year 8 months to 2 years 6 months of age. Cattle have been produced in carload lots weighing 1700 pounds when only 2 years and 7 months old. Lighter weight "baby beef" is made more economically in many instances.

The basis of this method of feeding is to supply the steer liberally and constantly with the right kind of feed during the first 2 years of his life. They should run with their dams until weaned, being taught to eat about five weeks before weaning, and given a little cornmeal and ground oats mixed; for the next 6 or 7 months they should have a mixed ration of corn, oats ground or whole, oilmeal and wheat bran; not all of these feeds at one time, but 2 or 3

varieties at each feed, and corn should be made the principal feed, about four-fifths of all concentrated feeds.

Steers should have all the feed they can clean up and digest well. A peck of sound dry corn or a little more, with 2 or 3 pounds of old process oilmeal or the same quantity of gluten meal, together with a pint or so of wheat bran, with suitable roughage, makes a large enough ration for a two-year-old steer.

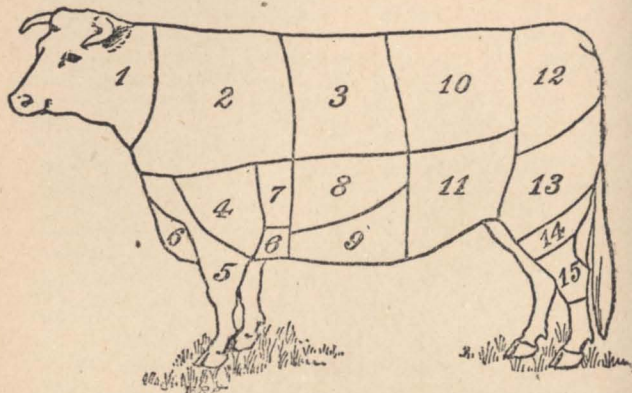


Diagram of cuts of beef: 1, neck; 2, chuck; 3, ribs; 4, shoulder clod; 5, fore shank; 6, brisket; 7, cross ribs; 8, plate; 9, navel; 10, loin; 11, flank; 12, rump; 13, round; 14, second cut round; 15, hind shank.

It is important when full-feeding stock that they consume a proper amount of roughage. The scheme has been tried of baiting the troughs with mixed clover and timothy or shredded fodder and distributing the concentrated feeds through this in such a way that the steers are obliged to eat one to get the other.

Feeding Range Cattle.—In buying range stockers, good grades are desired, in fair condition not less than 3 years old; they should weigh 1000 pounds or over. Between August and October they should go on full feed as quickly as possible, being fed husked corn from behind shredded fodder stacks during the winter.

Timothy and clover mixed are the old standbys for cattle; they can be run on it the year round. In order to make a satisfactory profit in feeding range cattle there

should be a daily gain of from 2 to 2½ pounds. With average conditions, that is, with corn at 35 cents and hay at \$8.50 and a proportionate price for other feeding stuffs, \$1.50 margin over cost price makes a satisfactory profit.

CATTLE:

Each of the various recognized breeds of domestic cattle may be placed in one of two general classes: beef cattle or

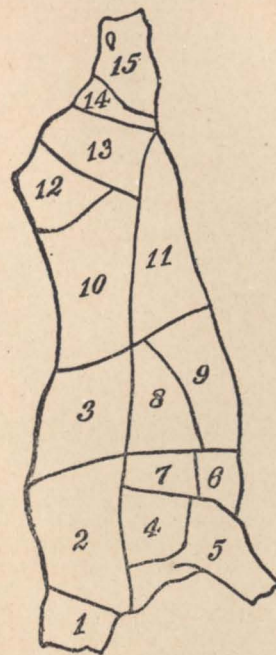


Diagram of cuts of beef. For numbers refer to preceding engraving.

dairy cattle, though some breeds are termed general or dual-purpose.

Ayrshires.—Ayrshires are medium-sized dairy cattle. The bulls attain a weight of 1,400 to 1,800 pounds at

maturity, sometimes being larger. The cows average probably 1,000 pounds in a well-maintained herd. They are short-legged, fine-boned, and very active. The Ayrshire cow is a large and persistent milker. A yield of 5,500 pounds a year, as an average for a working herd in good hands, is depended upon and often realized. The milk is not exceptionally rich, but somewhat above the average. Herd records show $3\frac{1}{2}$ to 4 per cent of butter-fat throughout the year. The breed is fairly well distributed in the north and east.

The Brown Swiss.—Commonly styled a dual-purpose breed. The udder and teats are large, well-formed and white, with milk veins very prominent. Mature animals weigh from 1,200 to 1,400 pounds and often more; bulls run up to 1,800 pounds and over.

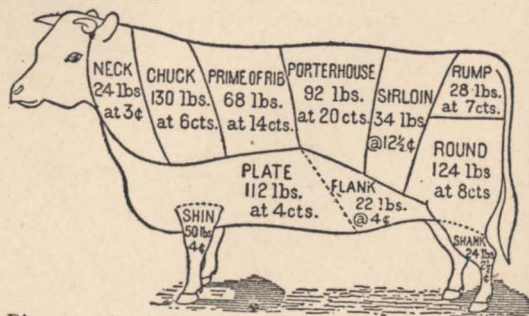


Diagram showing comparative values of cuts of beef.

Brown Swiss cows yield a generous flow of milk and hold out well. Good specimens may be expected to give 6,000 pounds a year and instances are known of 8,000 to 10,000 pounds. These cattle are good for beef as well as for the dairy. They are almost always full-fleshed, easily kept so, and readily fattened when not in milk. They have horns, are widely distributed and are growing in popular esteem.

Devons.—A horned breed, red in color, good milkers, of medium size, being about equal to the Ayrshires in general average. They have shown remarkable adaptability to varied conditions of topography and climate. They do well in most hilly and rigorous parts of New England and have proved well suited to the old field and pine lands of the Gulf states. Devons do not yield large quantities of

milk and are not persistent milkers; yet some families, bred and selected for dairy purposes, have made fair milk records. There are but few herds in the United States.

Dutch Belted.—Jet black in color with a broad band or belt of pure white encircling the body at the heart girth. The cattle are of the dairy type, although not to such a degree as some others. In size they rank with the Ayrshire. This breed is not numerous either in Europe or America. The claim of a leading breeder is that they are "deep milkers, practical, profitable, thrifty and picturesque in the extreme when seen as a herd in pasture."

Guernseys.—Guernseys are a size larger than the Jerseys, stronger-boned, and a little coarser in appearance. They are by some claimed to be hardier and larger milkers. Altogether they are at once recognized as belonging to the pronounced dairy type. They are light in color, the horns small, curved, fine, thin-shelled, and waxy in appearance.

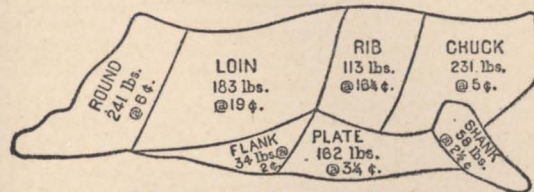


Diagram showing cuts of veal.

The butter is perhaps of a higher color at all seasons of the year than that of any other breed. The cows produce liberal quantities of milk, and it is of uncommon richness in butter-fat and in natural color. They are especially recommended for butter cows. Guernsey cows average 1,000 pounds in weight, or a little more.

Holstein-Friesians.—The striking features in appearance are the color markings of black and white and the large size of the animals. The average animal carries rather more black than white, and the distribution and outlines of the markings are extremely irregular.

In size they are the largest of all the dairy breeds. The cows range in weight from 1,100 and 1,400 with an average of about 1,250 pounds. The bulls at maturity are very large and heavy, often above 2,500 pounds in weight. Animals of both sexes can be turned into very good beasts for slaughter at almost any age.

Jerseys.—The smallest in size of the dairy breeds, cows

ranging from 700 to 1,000 pounds, and the bulls from 1,200 to 1,800 pounds. The average weight in America is considerably more than the average on their native land. In color they are of various shades of yellow, fawn and tan to a creamy white; also mouse color or squirrel gray, some light red and a few brindle.

Jerseys are usually of the typical dairy form. For years they have been bred especially and almost exclusively for butter, but in America breeders have striven with success to increase the milk yield, while maintaining its high quality. Two, three and four gallons per day are common yields. Single animals are on record as producing 9,000, 10,000 and 12,000 pounds of milk in a year. From 4 to 5 per cent of fat is usual. Jersey butter records are correspondingly large. Good herds are depended upon to produce 350 to 400 pounds of butter for every milking animal fed the full year. The Jersey is essentially a machine for producing milk—butter-making milk—and may be considered worthless when she ceases to give milk. The owner should depend for profit solely upon the produce of the cow while she is alive. The breed is strongly established in this country.

Red Polls.—Somewhat larger than the Devons, and, being of the same color and between the dairy and beef form, the resemblance is still greater. They are harmless, as their name indicates, have strong constitutions, are hardy and good grazers, active in movement, and quiet in disposition. Their friends press their merits strongly as a general-purpose breed or "farmer's cow."

Single selected cows give 30 to 40 and sometimes 50 pounds of milk a day, and hold out well, making yearly totals of 6,000 to 8,000 pounds or more. The tendency in this country among some breeders is to add to the size of the animals and improve the beef-producing capacity at the expense of dairy qualities.

Short-Horns.—In size the Short-Horns are probably the largest of the beef breeds. Bulls ordinarily weigh a ton or more, sometimes running up to 3,000 pounds; mature cows range from 1,200 to 1,800 pounds. The type is blocky, low-set, deep and thick. In the best milking strains the cows are rather more rangy and angular in outline, with large, hairy udders and good-sized straight teats, well placed. Records of several dairy herds in the United States within a quarter century shows a milking season of about 275 days and an average product of 6,500 pounds of milk. Single cows have averaged much more,

several instances being known of 10,000 to 12,000 pounds in a season. The color varies. It may be red, white or roan or a mixture of these. In numbers and extent of territory covered the Short-Horn excels any other beef breed.

Herefords.—Red with white face, white underline and over withers; specially adapted to the range or grass country; quick-maturing, hardy and excellent feeders; widely distributed. In size and type the Hereford is similar to the Short-horn, though in milking qualities the latter excels it. The breed is confined largely to the southwest, though its representatives abound in almost all the states.

Aberdeen-Angus.—A black polled breed which is growing rapidly in favor in the corn-belt to which it seems particularly well adapted. In feed-lots Angus steers are probably without an equal in their ability to make quick gains and a superior quality of beef. In size they are much the same as the other beef types, though as a rule more uniform and smoother. They do not produce sufficient milk as a rule for their own calves, especially where the herds have been highly specialized for beef production.

Polled Durhams.—Hornless Short-Horns, having all the characteristics of the latter breed save horns. They have become well established in America, where they originated, and are a popular general-purpose breed.

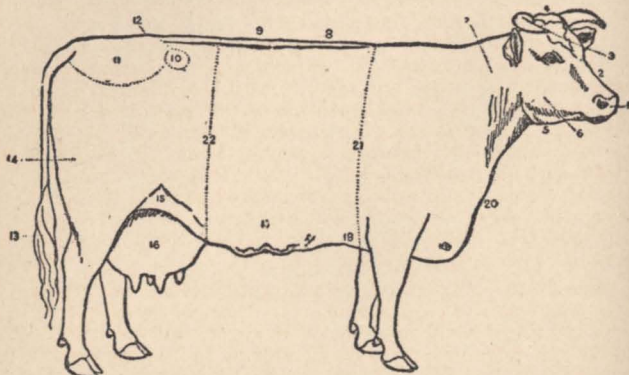
Galloways.—A black polled beef breed introduced from Scotland, very hardy and rugged, specially adapted to cold climes and grazing. Their coats are very rich, making valuable robes. Marked improvement has been made in the breed as beef cattle. They are not so large as some of the other beef breeds, and probably do not feed out so well.

HOW TO TELL A GOOD COW FOR DAIRY:

Head small and clean-cut; muzzle large; forehead straight or concave; neck long and thin without being scrawny; horns somewhat small; eyes bright and prominent; shoulders thin, loin broad but not thickly fleshed as in beef cattle; thighs thin; hind quarters long, deep, and powerful; flank high; legs short and wide apart; tail long, slim, and loosely jointed; frame markedly wedge shaped; tapering from rump to shoulder; udder set broadly on abdomen, of generous size, extending high up behind, well held up to abdomen, not loose, pendulous or fleshy; milk veins large and prominent, on both udder belly; teats medium size,

evenly placed, and wide apart. A fleshy udder, firm to touch when empty, and retaining its size and form after milking, indicates predisposition to inflammatory disease. Skin clean, with a fresh bright color; hair fine, thick, and soft; temperament active and docile; large feeder.

The main points in the selection of a cow are to secure large udders that are not fleshy, and large roomy bellies, showing capacity for consumption of large quantities of food. These are not always profitable cows, but they generally are. Cows are seldom profitable unless they produce at least 250 pounds, or more, of butter per year.



Names and location of points in external formation of the cow. 1, muzzle; 2, face; 3, forehead; 4, poll; 5, lower jaw; 6, cheek; 7, neck; 8, back; 9, loin; 10, hip or hook; 11, rump; 12, pelvic arch; 13, switch; 14, thigh; 15, flank; 16, udder; 17, barrel or belly; 18, fore flank; 19, brisket; 20, dewlap; 21, heart girth; 22, loin girth. (Mumford.)

DAIRYING:

The main thing to be worked for in dairying is the paying production of milk. To find which cows pay and which do not tests should be made. The old way was to set the milk in long test tubes cooled under the same conditions as the rest of the milk, but now what is known as the Babcock test is made. A sample of the milk to be tested is mixed with sulphuric acid in a Babcock test bottle and whirled in the testing machine, the fat rising to the top, where its height may be measured.

The "Fifty Dairy Rules of the United States Department

of Agriculture" sum up in a most concise manner the most important facts of dairying. They are as follows:

The Owner and His Helpers.—1. Read current daily literature and keep posted on new ideas. 2. Observe and enforce the utmost cleanliness about the cattle, their attendants, the stable, the dairy, and all utensils. 3. A person suffering from any disease, or who has been exposed to a contagious disease, must remain away from the cows and the milk.

The Stable.—4. Keep dairy cattle in a room or building by themselves. It is preferable to have no cellar below and no storage loft above. 5. Stables should be well ventilated, lighted, and drained; should have tight floors and walls and be plainly constructed. 6. Never use musty or dirty litter. 7. 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. 8. Whitewash the stable once or twice a year; use land plaster in the manure gutters daily. 9. Use no dry, dusty feed just previous to milking; if fodder is dusty, sprinkle it before it is fed. 10. Clean and thoroughly air the stable before milking; in hot weather sprinkle the floor. 11. 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.

The Cows.—12. Have the herd examined at least twice a year by a skilled veterinarian. 13. Promptly remove from the herd any animal 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. 14. Do not move cows faster than a comfortable walk while on the way to place of milking or feeding. 15. Never allow the cows to be excited by hard driving, abuse, loud talking or unnecessary disturbance; do not expose them to cold or storms. 16. Do not change the feed suddenly. 17. Feed liberally, and use only fresh, palatable feed stuffs; in no case should decomposed or mouldy material be used. 18. Provide water in abundance, easy of access, and always pure; fresh, but not too cold. 19. Salt should always be accessible. 20. Do not allow any strong flavored food, like silage, turnips, cabbage, and garlic, to be eaten, except immediately after milking. 21. 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. 22. Do not use milk within twenty days before calving, nor for three to five days afterwards.

Milking.—23. The milker should be clean in all respects; he should not use tobacco; he should wash and dry his hands just before milking. 24. The milker should wear a clean outer garment, used only when milking, and kept in a clean place at other times. 25. Brush the udder and surrounding parts just before milking, and wipe them with a clean, damp cloth or sponge. 26. Milk quietly, quickly, cleanly, and thoroughly. Cows do not like unnecessary noise or delay. Commence milking at exactly the same hour every morning and evening, and milk the cows in the same order. 27. 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. 28. If in any milking a part of the milk is bloody or stringy or unnatural in appearance, the whole mess should be rejected. 29. Milk with dry hands; never allow the hands to come in contact with the milk. 30. Do not allow dogs, cats or loafers to be around at milking time. 31. If any accident occurs 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. 32. 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.

Care of Milk.—33. 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. 34. Strain the milk through a metal gauze and a flannel cloth or layer of cotton as soon as it is drawn. 35. 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. 36. Never close a can containing warm milk which has not been aerated. 37. If cover is left off the can, a piece of cloth or mosquito netting should be used to keep out insects. 38. If milk is stored, it should be held in tanks of fresh, cold 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. 39. Keep the night milk under shelter so rain can not get into the cans. In warm weather hold it in a tank of fresh cold water. 40. Never mix fresh warm milk with that which has been cooled. 41. Do not allow the milk

to freeze. 42. Under no circumstances should anything be added to milk to prevent its souring. Cleanliness and cold are the only preventatives needed. 43. All milk should be in good condition when delivered. This may make it necessary to deliver twice a day during the hottest weather. 44. When cans are hauled far they should be full, and carried in a spring wagon. 45. In hot weather cover the cans, when moved in a wagon, with a clean wet blanket or canvas.

The Utensils.—46. 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. 47. 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. 48. Cans used for the return of skim milk or whey should be emptied and cleaned as soon as they arrive at the farm. 49. 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. 50. After cleaning, keep utensils inverted, in pure air, and in as much sunlight as possible, until wanted for use.

FEEDING FARM ANIMALS:

Domestic animals differ from wild breeds in that they produce fat milk, eggs, wool or other products in large quantities instead of in the small amounts necessary to sustain life and reproduce their kind. The improved animal has a greater stomach capacity and gives profitable returns when heavily fed. Besides this, there is the difference that animals fed scientifically or bred for a certain purpose place the weight where it is of the most use or fulfil the purpose for which they are bred.

The two sciences, physiology and chemistry, are used as a basis for stock feeding. The practical stock grower studies the feeds which are most effective to produce the results he wants, the amounts to be fed, combination and effects, it being the aim all the while to feed the most economical and effective ration so as to obtain the greatest possible results at least expense. The general rule in fattening an animal is to start as early as possible and market in the shortest possible time. This subject is treated more in detail under the heads, Cattle, Swine, etc., to which the reader is referred.

Composition of Foods.—While the ordinary farmer pays but little attention to the constituent foods which he gives his stock, yet it is at all times of advantage to know these constituents, as a guide to more intelligent feeding.

Protein denotes a group of compounds the principle constituent of which is nitrogen. Protein is necessary to animal life, building up the muscles and tissues of the body and at times furnishing heat and energy as well as forming fat.

Ether extract comprehends the oil and fats of feeding stuffs. Corn is one of the grains containing the most oil as is shown in its fattening tendency. Oats, flax, cotton and mustard are also rich in fat.

Carbohydrates denote starches, gums, and sugars, together with substances resembling them. Corn, potatoes and cassava are rich in carbohydrates, starch being obtained from these products. Carbohydrates together with fats and oils when digested give the heat and energy for the animal body. Besides this they also furnish the fat itself.

Crude fiber, the woody part of plants, does not aid in upbuilding of the animal body to any great extent. The coarser the fodder the greater the amount of crude fiber.

There are two broad classes of feeding stuffs; fodders and the grains. The ordinary feeding stuffs are 9 or 10 in number. Bran is the outer hull of grains and is fed sparingly to horses; it is an excellent dairy and fattening feed. Middlings or shorts are excellent feed for young pigs and are good feeds for any animal being fattened. In oat feed the hulls and a part of the kernels of the oat are of inferior value. Barley feed is a similar part of the barley grain. Corn is an excellent feeding stuff. Brewers' grains are valuable for feeding to dairy cows; when dried they make an excellent concentrate and stand shipment. Malt sprouts are nutritious but are not liked by animals. Cottonseed hulls are fed in the South along with cottonseed-meal. Cottonseed-meal is one of the most valuable and effective stock foods, being excellent for fattening steers and for milk cows. Hogs and cattle are injured by it if fed too liberally or for some time. Linseed meal having a high percentage of protein is beneficial to the health and appearance of all farm animals.

GOAT:

Raised to some extent in the United States for its hair, known as mohair, and also for meat, which is marketed,

however, under the name of mutton. In the eastern states where goats are raised they are given the same care as sheep. In the western states they are kept in large herds of several thousand, being allowed to range the same as sheep. These goats are sheared twice a year in the south, but one shearing is sufficient in the north.

A goat will yield 3 or 4 pounds of mohair, salable at 30 to 40 cents per pound.

HOG:

The hog is often called "the mortgage lifter" of the corn-belt from Ohio to Kansas, but its power in this direction is by no means confined to the region of the cheap corn. In the southern states more pounds of pork are used than that of all other meats combined.

Breeds.—The common breeds in this country are the Berkshires, Poland-Chinas, Chester-Whites, Duroc-Jerseys,

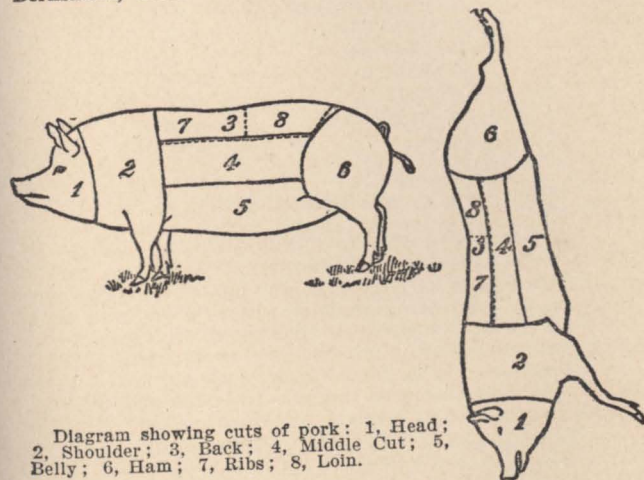


Diagram showing cuts of pork: 1, Head; 2, Shoulder; 3, Back; 4, Middle Cut; 5, Belly; 6, Ham; 7, Ribs; 8, Loin.

though Essex, Suffolks, large and small Yorkshires, Farnsworths, Victorias, Hampshires and a few others are occasionally seen. Many of the breeds have approached a common type and have the same general form. The bacon breeds, however, afford a striking contrast to the lard-and-pork varieties.

The Pork Hog.—The outline of a pork hog when viewed from any direction should be nearly that of a parallelogram with rounded corners; the back and belly as well as the sides should be straight and parallel; viewed from front or rear the outline should be nearly square, shoulders should be full and square with the legs set well apart; the back should be broad and straight and slightly arched; the hams should be as wide as the shoulders; nearly flat across at the top; the legs should be short and straight and set well apart.

The Bacon Hog.—Bacon hogs (Tamworths and large Yorkshires) are long, deep-bodied and upstanding.

Berkshire.—Black with white markings in face and white on feet; bred in most of the states; very prolific and make unsurpassed mothers for their young. They are good breeders.

Poland-China.—Strongest breed numerically in America; fatten quickly and mature early; black with white points and occasionally white spots; not as prolific as some other breeds; widely distributed.

Duroc-Jersey.—The modern type of this breed resembles that of the Poland-China; cherry red in color; good feeders, easily fattened and hardy; exceedingly prolific.

Chester Whites.—These are favorites where a white hog of the large type is wanted.

Essex.—This is a small, black hog, not common in America.

Victorias, Hampshires and Cheshires belong to about the same class, none of them being numerous in this country.

Large Yorkshire.—White in color; large, popular bacon type, a good breeder and rustler, making excellent bacon on forage and root crops. It is growing rapidly in favor, even in the corn belt.

Tamworth.—Red, noted for its prolificacy and hardiness. The Tamworth is a very satisfactory bacon type which is found in a number of states.

The Best Breeds.—There are no differences other than have been determined in the feeding qualities of the various breeds of hogs. As a general thing, the larger the hog when matured the more profitable feeder he is. There is no best breed. All have their place.

Boars.—What the pork raiser requires in the boar is good form and size without coarseness, good feeding capacity and good constitution. Short legs and short neck with short broad face usually indicate good fattening qualities.

Among the points to be avoided are a long head, long neck and legs. Boars should not be purchased until they are 4 or 5 months old, as they do not show their form fully before that time; they cost less at weaning time, but the chance of getting a poor animal is greater. A boar should never be allowed to run with the sows and it is much better to keep him in a lot where he can neither hear nor see other hogs.

Sows.—Sows for breeding can usually be selected from the drove. Sows selected should be good feeders and have a prospect of becoming good milkers. Usually a chunky, easily fattened, heavy-boned and short-legged sow is not as good a milker as one with a long body, longer legs and somewhat less rounded sides. A sow which is a good milker is usually a prolific, careful mother also. A boar and a sow having the same defects should never be mated.

Age at Which to Breed.—The usual breeding time for sows is 8 months old and after. In the south two litters may be raised yearly, having them come about April and October. Ordinarily sows, especially of certain breeds, cease to be prolific or profitable breeders after 4 or 5 years of age. If a sow more than 4 years old fails to give a good litter she may as well be fattened at once. When only one litter is raised yearly it should come about March.

Care of Breeding Sows.—A sow carrying pigs may be left with the drove for 2 months, afterwards being kept separate or with other pregnant sows; the feed should be mostly bone and muscle-producing, such as bran, ground oats and comparatively little corn. Fresh green feed is especially needed and if grazing is not convenient it should be cut and fed liberally. A week or 10 days before farrowing she should be put in a pen by herself where she will not be disturbed by other animals. The pen should have a floor and running around the sides a 12 inch plank should be fastened 8 or 10 inches above the floor to afford the pigs a safe place where the sow cannot crush or smother them. But little bedding should be used. A constant supply of salt and ashes is especially needed at this time to satisfy the cravings for such food which often causes sows to eat their young.

When the sow is about to farrow she should have only light feed and all the water she wants. If she has had proper feed and treatment she will rarely need assistance in farrowing, but the owner should be at hand and watch her closely and be ready to give help if needed.

After farrowing the sow should be given nothing but water during the first 24 hours, and afterwards fed but lightly for several days. Feeding the sow the first month is of more importance than at any other time; on this depends the vigor of the pigs. If the sow's milk supply is too small they will be stunted, and if too large they are almost sure to be affected with scours; so it requires close watching and good judgment to give the sow just the right amount of food to keep her and the pigs in the best of condition. When pigs show signs of scouring the sow should have less food and be given strong lime water to drink, or a little sulphur in feed. If the pigs can drink they should be given a little skimmed milk in which a little wheat flour has been mixed, and an egg stirred in with the milk for each two pigs will be beneficial. If the pigs are too young to drink they should be given 4 or 5 drops of paregoric.

Raising Pigs.—They begin to eat when about three weeks old and should be provided with a feeding place near the pen in which the sow is kept so that they can get at it when they wish to eat. A few grains of soaked corn will soon get the pigs in the habit of eating. Skimmed milk should be given them when they begin to drink. Cornmeal is too fattening and is a poor food for young pigs, unless used in connection with skimmed milk.

When the litter is three weeks old they should have the run of a lot where they can get sunshine, exercise and fresh grazing. The pigs will be able to feed themselves by the time they are 8 weeks old by grazing and will receive no check by weaning, as it will be very gradual. Pigs should have all the solid food they will eat while still sucking.

The sow will usually get in heat from one to two weeks after her pigs are weaned. If she is to be bred again she should be served the first opportunity.

The pigs should be pushed as rapidly as possible after weaning, for the sooner they can be made to weigh 200 pounds each the more profitable they will be.

Castrating and Spaying.—Young boars not wanted for breeding may be castrated at any time after they are a month old; if done at from 4 to 6 weeks they will have fully recovered by the time they are weaned. If not done then it is better to wait until a month after weaning so that they will have been accustomed to the change of food.

Spaying young sows is not difficult and should be more general. It is best done when they are between 3 and 4 months old. Spayed animals are more quiet and better feeders than open sows, making better pork and usually sell for better prices.

Pasture.—Hog raising can seldom be made profitable without a good permanent pasture where the hogs can get a large proportion of their coarser food at a nominal price. Red clover is excellent and alfalfa is good. A good pasture is as necessary for hogs as for the growing of beef animals. Hogs are wasteful grazers when turned into rank pasturage and a great saving can be secured by growing the different grazing crops in narrow fields which can be divided into sections by the removal of transverse fences.

Feeding.—Cooking feed is rarely profitable. Irish potatoes are greatly improved by cooking but few other feeds are. One item of feed which should never be neglected is a good supply of salt and ashes to which the hogs can have access at all times.

Large and small hogs should never be fed together and no feed should be thrown on the ground.

In fattening for the market the feeder should induce his hogs to eat all they can digest in order to secure gains as rapidly as possible. A pig which is made to weigh 200 pounds at six months old or 300 pounds at 9 months of age is likely to be profitable, while if it takes two years to make 300 pounds the last 100 pounds is usually made at a loss. The time to market hogs ordinarily is when the hogs weigh from 250 to 300 pounds. The table of the Wisconsin experiment station in which was compiled the results of more than 500 tests made at different experiment stations may be regarded as very conclusive evidence. The figures are as follows:

Weight of pigs.	Average feed per day	Feed eaten daily per 100 pounds of live weight.	Average gain per day.	Feed eaten for each 100 pounds of gain.
Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
15-50	0.223	5.95	0.76	293
50-100	3.35	4.32	.83	400
100-150	4.79	3.75	1.10	437
150-200	5.91	3.43	1.24	482
200-250	6.57	2.91	1.33	498
250-300	7.40	2.74	1.46	511
300-350	7.50	2.35	1.40	535

This table shows the greatest as well as the most profitable gains were made on the lighter hogs. It is always to be remembered that summer feeding is cheap, while winter feeding is expensive and as much of the gain should be made by grazing and as little from the crib as possible.

Diseases.—The most common disease affecting hogs is hog cholera. Swine plague is somewhat different from hog cholera, but the same remedy will apply. Although there is no remedy known which is invariably successful, Dr. Salmon recommends the use of the following:

	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.

The dose of this mixture is a large tablespoonful for each 200 pounds weight of hogs to be treated, and it should be given only once a day.

Prevention, however, is much better than treatment. It is considered contagious and care should be taken that infection is not carried in any way. Dead animals should be burned instead of being buried. The disease is so fatal and so difficult to treat that too much care cannot be taken to prevent its spreading.

HORSE:

A quadruped, the most common animal of draft, used throughout the world. The main use of horses in the United States is for the purposes of draft, though in Europe they are used to a considerable extent for food.

The mare carries her foal on an average of 11 months or 330 days; when born it commonly weighs about 100 pounds and has a daily increase of from 1 to 3 pounds while young. The work that a horse can perform has been accurately determined, and all engines are given a specified horsepower. The horse is able to do the most work when driven at the speed of about 2 miles per hour. Unlike stock farms, there are few places where horses are

bred to the exclusion of other stock, being generally raised as a side line. This is one of the reasons why there are seldom a uniform number of animals of high class on the market.

There are 5 classes of horses which are recognized on the Chicago market; these are: (1) The cab horse; (2) the carriage horse; (3) the bus horse; (4) the draft horse; (5) the American trotter.

The carriage horse should weigh about 1,100 pounds and stand 15 to 16 hands high; cab horses weigh from 1,050 to 1,100 pounds and stand about 15 hands high. A typical general-purpose horse is needed to answer the description of a bus horse, should stand about 15 to 16 hands high and weigh 1,250 to 1,500 pounds. A good general-purpose horse is the requirement for a draft horse, while the trotting horse is very seldom raised by the average farmer, as it requires too much attention to breed.

Breeds of Horses.—Percherons are the most widely distributed draft breed in America. They were introduced from France, and are sometimes called Normans. Clydesdales, originating in Scotland, are the second most important draft breed in this country. Shires closely resemble them. Belgians are generally heavier than any other drafters. Suffolks are more of the general-purpose type. German and French Coachers are general-purpose breeds. Hackneys, thoroughbreds and standard-breds, furnish the high-acting and speed horses. Shetland ponies are diminutive horses, 42 inches being their standard of height. Welsh ponies are bred by a few farmers in the eastern states.

The safest way of determining the age of a horse is by the appearance of the teeth, which undergo certain changes in the course of years.

Eight to fourteen days after birth, the first middle nippers of the set of milk teeth are cut (Fig. 1), four to six weeks afterwards the pair next to them (Fig. 2), and finally, after six or eight months, the last (Fig. 3).

All these milk teeth have a well defined body and neck, and a slender fang, and on their front surface grooves of furrows, which disappear from the middle nippers at the end of one year, from the next pair in two years, and from the incisive teeth (cutters) in three years.

At the age of two the nippers become loose and fall out, in their places appear two permanent teeth, with deep, black cavities, and full, sharp edges (Fig. 4).

At the age of three, the next pair (Fig. 5) fall out.

At four years old, the corner teeth fall out (Fig. 6).

At five years old, the horse has his permanent set of teeth.

The teeth grow in length as the horse advances in years, but at the same time his teeth are worn away by use about one-twelfth of an inch every year, so that the black cavities of the center nippers below disappear in the sixth year (Fig. 7), those of the next pair in the seventh year (Fig. 8), and those of the corner teeth in the eighth year (Fig. 9). Also the outer corner teeth of upper and lower jaw just meet at eight years of age.

At nine years old, cups leave the two center nippers above, and each of the two upper corner teeth has a little sharp protrusion at the extreme outer corner (Fig. 10).



Changes in the teeth of horses, due to age.

At the age of ten, the cups disappear from the adjoining teeth.

At the age of eleven, the cups disappear from the corner teeth above, and are only indicated by brownish spots.

The oval form becomes broader, and changes, from the twelfth to the sixteenth year, more and more into a triangular form, and the teeth lose, finally, with the twentieth year, all regularity. There is nothing remaining in the teeth that can afterwards clearly show the age of the horse, or justify the most experienced examiner in giving a positive opinion.

The tushes, or canine teeth, conical in shape, with a sharp point, and curved, are cut between the third and fourth year, their points become more and more rounded until the ninth year, and after that, more and more dull

in the course of years, and lose, finally, all regular shape. Mares have, frequently, no tusks, or only those very faintly indicated.

Vices.—Cribbing is one of the most injurious habits to which a horse can be addicted. Horses which have contracted the cribbing habit seize the edge of the manger in their teeth; this is often accompanied by a continuous drawing in of air when it is known as wind sucking. To remedy this vice use an open iron muzzle which so arranged with sharp points as to prick the lips when attempt is made to crib.

Feeding.—Feed given horses depends greatly upon the locality and the season. During the winter in the northern states horses are fed hay and one or more kinds of grain. During the summer months they are often allowed to run in the pasture when not at work and fed enough grain to keep them in condition. Oats is the standard grain for horses, especially in the northern states, it being held by many horsemen that they possess peculiar properties that are found in no other grain. However, horses kept on other grains do nearly as well as those fed to a great extent on oats. Barley may be accepted as a substitute for oats, but it takes slightly more of the grain and is better if ground; it appears to be more fattening.

Brans, especially when mixed with shorts, is equal or slightly superior to oats in feeding value. Cottonseed-meal has a high feeding value, being fed at rate of 2 to 2½ pounds per day per horse. It is not commonly used for horses. More than 5 or 6 pounds should never be fed. Corn is an important grain for horses, ranking next to oats, being fed more in the south than in the north. Kaffir corn is well liked by horses; they eat both the corn and the stalks to good advantage.

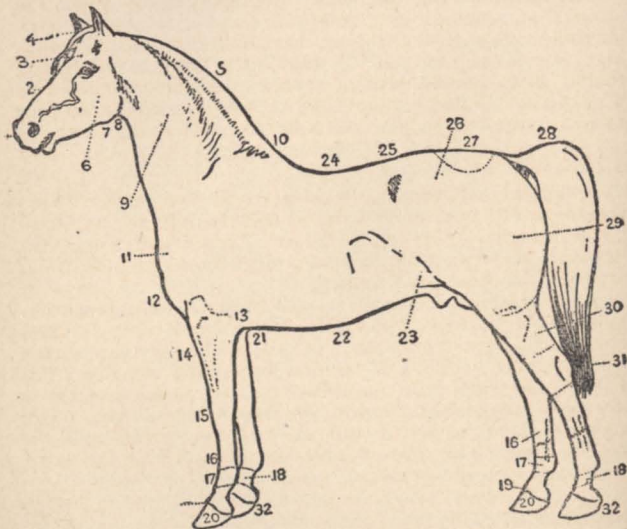
Wheat is not fed to any great extent to horses; however, it has been found to be beneficial in building up a horse run down by hard work or giving the necessary bottom for unusually hard labor.

Corn Fodder.—The standard hay in the north is timothy, though timothy and clover is fed to a large extent. Alfalfa as a rule is superior to timothy in its feeding value. Clover hay if clean and well cured and not affected with dust or must is more nutritious than timothy; if not of excellent quality it produces heaves. Corn silage and corn stover are both economical feeds for horses. Straw is sometimes fed when hay is short; oat straw is the best, followed by barley, wheat and rye. More grain must be fed when straw

is substituted for a hay ration. Timothy is preferred by nearly all horse raisers but should not be fed to the exclusion of other rough fodder. Roots and miscellaneous feed, such as rutabagas, artichokes and potatoes are fed to horses to some extent.

HOW TO TELL A GOOD HORSE:

For Speed.—Height, 15½ hands; least weight, 1,000 pounds; ears, pointed, flexible, set on side, not on top of head; head, symmetrical, full under forelock and between ears; neck, long and slim, with little or no arch, set well



Names and locations of points used in referring to the external conformation of the horse. 1, muzzle; 2, face; 3, forehead; 4, poll; 5, crest; 6, cheek; 7, lower jaw; 8, throat; 9, neck; 10, withers; 11, point of shoulder; 12, breast; 13, elbow; 14, forearm; 15, knee; 16, cannon or shank; 17, fetlock; 18, pastern; 19, coronet; 20, foot; 21, girth; 22, belly; 23, flank; 24, back; 25, loin; 26, haunch or hip; 27, croup; 28, dock; 29, thigh or quarter; 30, lower thigh or gaskin; 31, hock; 32, heel. (Mumford.)

up on "top corner" of body; front legs reaching out true, strong and straight; front feet not thrown sidewise when

speeding; shoulders, set on obliquely; body, short top line, long lower line; hips well forward; muscles along back prominent, development judged by pressure with thumb and fingers; hind legs crooked at hock (but not too much so or they will be weak, and not too little or animal will "pound"); portion of leg from hock to fetlock and also from knee to fetlock relatively short and broad (nor roundish) when viewed from the side, but thin when seen from the rear; line drawn from hock to fetlock nearly straight, concave rather than convex; if convex it is "curby"; hoofs not pointing out; skin moderately thick and firm; chest capacity large; body round.

For Work.—Full forehead; intelligent face; shoulders strong and sloping; gait free and easy; stride long; arm muscular; legs strong, rather short and flat; pastern sloping; feet large and not too flat; body large in girth and round; back broad, with muscular quarters; croup wide; weight (not clumsy) from 1,200 to 1,600 pounds, according to work required; horse docile, hearty, and easily kept.

THE MULE:

A hybrid between the male ass and the mare. There are various strains of jacks used in breeding, as the Catalonian, height, 14½ to 15 hands; Andalusian, somewhat heavier; Majorca, a large animal 16 hands high; Maltese, a small, smooth-coated animal.

Mule raising became of relatively great importance because of recent wars, the southern and south central states raising the largest numbers. Mules are better than horses for extremely hard labor, irregular living and freedom from disease; they are also small feeders. There are two types of mules recognized in the southern states: the sugar mule—a large, powerful animal—and the cotton mule, a smaller type. The care of mules is substantially the same as the care of the horse.

SHEEP:

A common domestic animal kept for its wool and flesh, which is called mutton.

Breeds.—The general classification is Merinos and Coarse-Wools. Merinos have wool of fine fibre and are of many families, as Rambouillets, Delaines, Spanish, etc.

Merinos are hardy and noted as being good "rangers." They are not the best feeders, their food going to produce wool more than flesh. Ordinary types of Merinos produce rams weighing from 120 to 175 pounds, with ewes weigh-

ing from 80 to 140 pounds. Originally the wool was the main thing considered in a Merino; now the sheep are bred with more and better mutton under the wool.

Delaines have a combing wool and a good body. Rambouillets are the largest and most "muttony" of Merinos, rams weighing sometimes 300 pounds and ewes 200. They are found in numbers on the western ranges.

Coarse-Wools—These are divided into Long-Wools (Lincolns, Cotswolds, Oxfords, Leicesters and some less common breeds), and Downs or Middle-Wools (Shropshires, Southdowns, Hampshires, Suffolks and Dorsets), with yet a third class, the Mountain Breeds (Chevoits, Black-faced Scotch and Welsh Mountain.)

Lincoln.—The heaviest of mutton breed, with an abundant, long, coarse fleece.

Cotswold.—Like the Lincoln, being more popular in the United States and desirable for crossing on Merinos on the ranges.

Leicester.—Fatten prodigiously and are useful for cross-breeding.

Oxfords.—Sometimes classed among the Downs; they have black or brown faces and legs, excellent for mutton or cross-breeding.

Southdown.—The "aristocrat" of longest lineage of the Down breeds; small, neat, easily fattened.

Shropshire.—Most popular of all mutton breeds; white with black or brown points; larger than the Southdown which it resembles.

Hampshire.—Larger than Shropshires, with blacker points and closer wool, an excellent feeder, reputed the best for making big fat lambs from hurdles.

Suffolk.—Like the Hampshires in many respects.

Dorsets.—A horned breed with white points, once the dairy sheep of South England, now famed for its fat winter lambs.

Cheviot.—Of the mountain breeds this is the most common in America; it is active, profitable, adapted to grazing and to cool climates and high pastures.

Care.—Wet is bad for sheep; they should have dry footing in well littered sheds and yards, and kept sheltered from rains so far as possible.

Feed for Breeding Ewes.—Alfalfa hay where it is to be had, clover or cowpea hay elsewhere are a good basis. Add corn stover and half a pound daily of grain, oats or bran

or the two mixed. Corn silage may well form part of the ration.

Flushing Ewes.—Well fed ewes bear more twins than starved ones. Two or three weeks before breeding them begin to feed a moderate grain ration, putting also on fresh pasture, and a larger increase will result.

The Ram.—Select one of vigor to head the flock. He may be mated with 50 ewes but should not be permitted to run with them. He may be turned with them at night and taken away early in the morning, being carefully fed and kept quiet during the day time. A yearling ram will do good service, though an older one is more capable.

Lambing.—Shepherds must give close attention when lambs come. Often to help the lamb to its first meal will save its life, and always the milk should be started from the teats of the ewe and loose tags of wool pulled away. When there are twins, or the lamb is weak, place the ewe and her offspring in a small pen where they may remain together until they become strong and attached to each other.

Should a ewe lose her lamb, immediately remove its skin and slip it over some twin that may thus be adopted by a foster mother and thrive the more with all the milk. A chilled lamb is best revived by a bath in a tub of water as hot as one can bear his hand.

Weaning.—Lambs should be accustomed almost from birth to eating hay and grain in some place apart from their mothers. The ram lambs may be weaned at the age of about four months, though ewe lambs may run with their mothers for a longer time. Weaned lambs must always be placed upon fresh pasture, apart from all older sheep which might infect them with parasites.

Water is essential to the flock at all times save when pasturing rape or other succulent forage. Salt should be always at hand. Rock salt is convenient; if barrel salt is used it should be fed liberally so that the sheep will not become hungry for it.

Whether it pays to feed lambs before weaning or not depends upon the location of the flock. On western ranges grass is the cheaper feed. Upon farms east of the Mississippi river it is more profitable to force the lambs to quick maturity with grain from birth. Cracked corn with wheat bran is a good ration for beginning feed. Wheat bran is an excellent source of bone and muscle in the lamb; corn of fat. Alfalfa or clover hay should form the basis of the feed.

Rape.—Much like cabbage in its qualities and makes much food in summer or fall, lasting until cold weather. If sheep or lambs bloat upon rape or alfalfa pasture administer a raw egg, or a half pint of sweet milk to which has been added some lime water. A trochar should be the last resort in case the bloating continues. When turning sheep on alfalfa pasture feed them well just before turning on and be sure that the alfalfa is sufficiently mature to be near the blooming stage.

Fattening Sheep.—Lambs should be started on alfalfa hay or clover with a very small ration of grain, which may

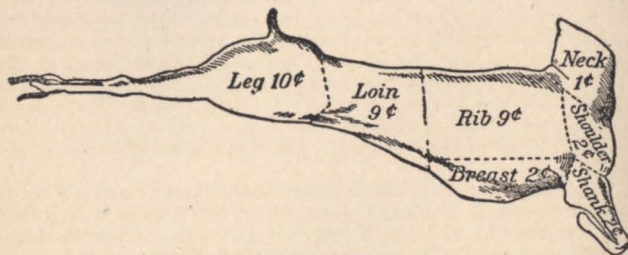


Diagram showing cuts of mutton.

be slowly increased. Silage in connection is a great aid. A gain of a quarter of a pound per day is considered very good. Lambs make cheaper gains than cattle, being younger.

Feeds.—Barley is excellent, but being rich must not be fed in large amounts at first. Corn has in it more fat than any other grain. Oats are invaluable in the breeding flock but are usually too dear for the feeder. Peas or soy beans are profitably fed with corn. They are very rich in protein. Screenings vary much; they may have half the feeding value of corn. Wheat is nearly as good as corn.

Range Methods.—When a ranger has 50,000 to 100,000 sheep grazing on free grass he adopts methods suited to his environment. A man with dog may have 2,500 in his care; he moves about following the grass and water. Provision for winter is becoming more and more common, though the larger number of range sheep are not fed at any time of the year. During the lambing season the bands are made smaller and more men are employed to save the lambs. In some regions sheds are used; generally they are not. Shearing is late, and often done by machine.

Diseases.—There are two principal diseases of sheep on the ranges; scab and starvation. Scab is caused by a minute parasite similar to a crab louse. It is cured by immersion of the sheep in any good dip. Favorite dips are the coal tar preparations, also the lime and sulphur dip made on the range. Tobacco dips are effective and leave the wool in good condition.

Head scab is caused by a burrowing parasite. Foot-rot is seldom seen on dry ranges; it is always infectious and should be combatted vigorously. To cure it pare away all diseased horn and apply a strong solution of bluestone, or of butyr of antimony. A trough with three inches of lime whitewash and a little bluestone, through which the flock is caused to pass, prevents the spread of the disorder. The gad-fly annoys the farm flock and causes "grub in the head." A preventive is to have a cool, dark shed for the flock to lie in in day time. The sheep tick is like a small crab; it causes great annoyance and loss of thrift. Any dip will destroy it. Repeat the dipping in 10 days to get the eggs.

The stomach worm destroys more lambs than all other causes. It is a minute worm about the size of a hair and three-fourths of an inch long. It inhabits the fourth stomach and causes the condition called "paper skin," characterized by whiteness of skin and listlessness. Scours often appear, or constipation, and death sooner or later. The cause is infection from the older sheep which deposit the germs upon the young and tender grass, whence they are taken in by the lambs. Prevention consists in giving the lambs early birthright, then good food, pushing them forward, and at weaning time pasture away from all older sheep and on land not grazed by any sheep that year. Cure is possible; doses of a teaspoonful to three teaspoonfuls of gasoline in half a glass of sweet milk, given after fasting 16 hours, and repeated three days in succession, will cure about all cases.

PEDIGREE REGISTRY ASSOCIATIONS:

Following is a complete list of all the cattle, horse, sheep and hog registry associations in the United States, together with the name and addresses of their secretaries.

CATTLE:

American Aberdeen-Angus Breeders' Association—Thomas McFarlane, Pedigree Record Building, Union Stock Yards, Chicago, Secretary.

- American Branch Association of the North Holland Herd Book.—N. F. Sluiter, Brooklyn, N. Y., Secretary.
- American Devon Cattle Club—L. P. Sisson, Newark, O., Secretary.
- American Galloway Breeders' Association—Chas. Gray, Pedigree Record Building, Union Stock Yards, Chicago, Secretary.
- American Guernsey Cattle Club—W. H. Caldwell, Peterboro, N. H., Secretary.
- American Hereford Breeders' Association—C. R. Thomas, Stock Yards, Kansas City, Mo., Secretary.
- American Jersey Cattle Club—J. J. Hemingway, New York, Secretary.
- American Normandy Herd Book Association—E. G. Kramer, New York, Secretary.
- American Polled Durham Breeders' Association—Fletcher S. Hines, Indianapolis, Ind., Secretary.
- American Simmental Herd Book Association—E. G. Kramer, New York, Secretary.
- American Short-horn Breeders' Association—John W. Groves, Pedigree Record Building, Union Stock Yards, Chicago, Secretary.
- American Sussex Breeders' Association—Overton Lea, Nashville, Tenn., Secretary.
- Ayrshire Breeders' Association—C. M. Winslow, Brandon, Vt., Secretary.
- Breeders' Association of French-Canadian Cattle of the United States—W. J. McMurdy, Binghamton, N. Y., Secretary.
- Brown Swiss Cattle Breeders' Association—N. S. Fish, Groton, Conn., Secretary.
- Dutch Belted Cattle Association of America—H. B. Richards, Eston, Pa., Secretary.
- Holstein-Friesian Association of America—F. L. Houghton, Brattleboro, Vt., Secretary.
- Maine State Jersey Cattle Association—N. R. Pike, Winthrop, Me., Secretary.
- National Polled Hereford Breeders' Association—A. E. White, Chicago, Secretary, 5629 Madison Ave.
- Red Polled Cattle Club of America (incorporated)—Harley A. Martin, Gotham, Wis., Secretary.

HORSES—Horse Registers.

- American Association of Importers and Breeders of Belgian Draft Horses—J. D. Conner, J., Wabash, Ind., Secretary.

- American Breeders' Association of Jacks and Jennets—J. W. Jones, Columbia, Tenn., Secretary.
- American Clydesdale Association—R. B. Ogilvie, Union Stock Yards, Chicago, Secretary.
- American Hackney Horse Society—A. H. Godfrey, New York, Secretary.
- Percheron Society of America—Geo. W. Stubblefield, Union Stock Yards, Chicago, Secretary.
- American Saddle Horse Breeders' Association—I. B. Nall, Louisville, Ky., Secretary.
- American Shetland Pony Club—Mortimer Levering, Lafayette, Ind., Secretary.
- American Shire Horse Breeders' Association—Chas. Burgess, Wenona, Ill., Secretary.
- American Stud Book (Thoroughbreds)—James E. Wheeler, New York, Registrar.
- American Trotting Register Co.—W. H. Knight, Chicago, Secretary.
- American Suffolk Horse Association—Alexander Galbraith, Janesville, Wis., Secretary.
- Cleveland Bay Society of America—R. P. Stericker, West Orange, N. J., Secretary.
- French Coach Horse Society of America—Duncan E. Willett, 2112 Michigan Avenue, Chicago, Secretary.
- German, Hanoverian and Oldenburg Coach Horse Breeders' Association—J. Crouch, Lafayette, Ind., Secretary.
- Morgan Horse Register—Joseph Battel, Middlebury, Vt., Editor.
- National French Draft Horse Association—C. E. Stubbs, Fairfield, Ia., Secretary.
- Oldenburg Coach Horse Association of America—C. E. Stubbs, Fairfield, Ia., Secretary.

SHEEP—Sheep Registers.

- American Angora Goat Breeders' Association—John W. Fulton, Kansas City, Mo., Secretary.
- American Cheviot Sheep Society—F. E. Dawley, Fayetteville, N. Y., Secretary.
- American Cotswold Association—Frank W. Harding, Waukesha, Wis., Secretary.
- American Leicester Breeders' Association—A. J. Temple, Cameron, Ill., Secretary.
- American Milch Goat Record Association—W. A. Shafor, Hamilton, O., Secretary.
- American Oxford Down Association—W. A. Shafor, Hamilton, O., Secretary.

- American Rambouillet Sheep-Breeders' Association—Dwight Lincoln, Milford Center, O., Secretary.
- American Shropshire Registry Association—Mortimer Levering, Lafayette, Ind., Secretary.
- American Southdown Breeders' Association—Frank S. Springer, Springfield, Ill., Secretary.
- American Suffolk Flock Registry Association—Geo. W. Franklin, Des Moines, Ia., Secretary.
- American Tunis Sheep-Breeders' Association—Charles Rountree, Crawfordsville, Ind., Secretary.
- Black-Top Spanish Merino Sheep-Breeders' Publishing Association—R. P. Berry, Clokey, Pa., Secretary.
- Continental Dorset Club—Joseph E. Wing, Mechanicsburg, O., Secretary.
- Dickinson Record Co.—H. G. McDowell, Canton, O., Secretary.
- Dorset Horn Breeders' Association of America—M. A. Cooper, Washington, Pa., Secretary.
- Franco-American Merino Sheep-Breeders' Association—John P. Ray, Hemlock, N. Y., Secretary.
- Hampshire Down Breeders' Association of America—C. A. Tyler, Nottawa, Mich., Secretary.
- Improved Black-Top Delaine Merino Sheep-Breeders' Association—M. O. Robertson, Eaton Rapids, Mich., Secretary.
- Improved Delaine Merino Sheep-Breeders' Association—George A. Henry, Bellefontaine, O., Secretary.
- International Delaine Merino Sheep Record—U. C. Brouse, Kendallville, Ind., Secretary.
- International von Homeyer Rambouillet Club—E. M. Moore, Orchard Lake, Mich., Secretary.
- Interstate and International Polled Dickinson Register—H. G. McDowell, Canton, O., Secretary.
- Michigan Merino Sheep-Breeders Association—E. N. Ball, Hamburg, Mich., Secretary.
- National Delaine Merino Sheep-Breeders' Association—John B. McClelland, Canonsburg, Pa., Secretary.
- National Lincoln Sheep-Breeders' Association—Bert Smith, Charlotte, Mich., Secretary.
- National Merino Sheep Register Association—R. O. Logan, California, Mich., Secretary.
- National Shropshire Record Association—S. J. Weber, Middleville, Mich.
- New York State American Merino Sheep-Breeders' Association—J. Horatio Earll, Skaneateles, N. Y., Secretary.
- Ohio Merino Sheep-Breeders' Association—Wesley Bishop, Troyton, O., Secretary.

- Standard American Merino Sheep Breeders' Association—John P. Ray, Hemlock, N. Y., Secretary.
- Standard Delaine Spanish Merino Sheep-Breeders' Association—S. M. Cleaver, West Brownsville, Pa., Secretary.
- United States Merino Sheep Registry Association—J. A. B. Walker, Mount Air, Pa., Secretary.
- Vermont Merino Sheep-Breeders' Association—C. A. Chapman, Ferrisburgh, Vt., Secretary.

HOGS—Swine Registers:

- American Berkshire Association—Frank S. Springer, Springfield, Ill., Secretary.
- American Chester White Record Association—Earnest Freigau, Dayton, O., Secretary.
- American Duroc-Jersey Swine-Breeders' Association—S. E. Morton, Camden, O., Secretary.
- American Essex Association—F. M. Srout, McLean, Ill., Secretary.
- American Poland-China Record Co.—W. M. McFadden, Pedigree Record Building, Union Stock Yards, Chicago, Secretary.
- American Tamworth Swine Record Association—E. N. Ball, Hamburg, Mich., Secretary.
- American Hampshire (Thin-Rind) Swine Record Association—E. C. Stone, Armstrong, Ill., Secretary.
- American Yorkshire Club—H. G. Krum, White Bear Lake, Minn., Secretary.
- Central Poland-China Record Association—W. H. Morris, Indianapolis, Ind., Secretary.
- Cheshire Swine-Breeders' Association—B. B. Badger, Ouaquaga, N. Y., Secretary.
- Improved Smoll Yorkshire Club of America—F. B. Stewart, Espyville, Pa., Secretary.
- National Berkshire Record Association—E. K. Morris, Indianapolis, Ind., Secretary.
- National Chester White Record Association—Thomas Sharpless, West Chester, Pa., Secretary.
- National Duroc-Jersey Swine-Breeders' Association—Robert J. Evans, Peoria, Ill., Secretary.
- O. I. C. Swine Breeders' Association—C. M. Hiles, Cleveland, O., Secretary.
- Ohio Poland-China Record Co.—A. M. Brown, Dayton, O., Secretary.
- Southwestern Poland-China Record Association—H. P. Wilson, Gadsden, Tenn., Secretary.

Standard Chester White Record Association—W. H. Morris, Indianapolis, Ind., Secretary.

Standard Poland-China Record Co.—George F. Woodworth, Maryville, Mo., Secretary.

United States Small Yorkshire Association—D. T. Bascom, California, Mich.

Victoria Swine-Breeders' Association—H. Davis, Dyer, Ind., Secretary.

PART IV.

POULTRY AND BEES.

POULTRY:

The barnyard fowls are regarded by most farmers as a very insignificant part of their live stock; and yet, although so often neglected and forced to shift for themselves, the poultry and egg crop constitute in the aggregate one of the most important and valuable products of American agriculture. There is no stock on the farm that yields a better relative return to the food 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.

Kind.—The kind of chickens to be kept on a farm depends almost as much upon the kind of a 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, vigorous, and yield a fair return in eggs or 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. If, however, the highest returns are expected which care and skillful management can obtain, then a breed of fowls should be adopted which has been bred for generations with this object in view.

Varieties.—The most popular fowls in the United States are the American breeds known as the Plymouth Rocks, Wyandottes and Rhode Island Reds. They are of medium



Heads of various breeds of fowls: 1, Barred Plymouth Rock; 2, Single Comb White Leghorn; 3, Black Langshan; 4, Black Minorca; 5, Silver Laced Wyandotte; 6, Single Comb Brown Leghorn; 7, Light Brahma; 8, White-crested Black Polish; 9, Black Java; 10, White-faced Black Spanish; Partridge Cochinchina (hen).

size, good as broilers, good as roasters, good egg producers; the hens are good setters, 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, Silver, Buff, Golden, Black Partridge, Silver Penciled and Columbian Wyandottes, there is a sufficient range of color to meet almost any taste.

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 Rocks or Wyandottes, and as layers they are unsurpassed. Should it be desirable, 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.

In purchasing breeding stocks 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 of feathering.

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 and gathering up the many seeds and grains which otherwise would not be utilized. The house should be located upon soil which is well drained and dry. A gravelly knoll is best, but failing this, the site should be raised by the use of the plow and scraper until there is a gentle slope in all directions to prevent any standing water even at the wettest times. A few inches of sand or gravel on the surface will be very useful in preventing the formation of mud. If the house is sheltered from the north and northwest winds by a group of evergreens this will be a decided advantage in the colder parts of the country.

A poultry house should be tight enough to exclude draughts, dry and well lighted. It has been demonstrated that heavy muslin is rather better than glass in the windows and many poultry houses are now made with a large portion of the south side of muslin. The front of the poultry house should face the south.

The roosts may be made of two by three inch scantling and should be so put in that they can be easily removed at any time for cleaning and disinfection. A platform is

often placed under the roosts to catch the droppings and the nests are often placed under this platform.

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 away 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. This may be secured by making enclosed boxes with the opening away from the windows.

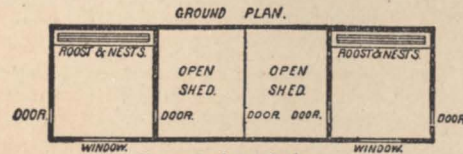


Small, economical poultry house with open sheds.

Floor.—One of the most troublesome parts of a poultry house to make satisfactory is the floor. 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 sufficient space beneath for ventilation and to guard against the lodgement of rats.

Good Plans.—A good style of poultry house, where more than one flock is to be kept, is the plan shown in the above cut. This has 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 on both sides, so that the birds may be kept confined.

Coops.—A liberal supply of coops should be provided for the confinement of hens with broods of small chicks,



Ground plan of above.

and for those hens which insist upon sitting at inconvenient times. A few days in solitary retirement will usually break

up the desire to sit, and the hen will soon after resume laying.

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 cleaning or of catching a bird in it without danger of some of the birds escaping. To obviate this, one of the slats may be made to slide. The opening made by sliding this slat is sufficient to admit the hand and arm so that any part of the coop may be reached without danger of letting the hen out.

Ranging of Fowls.—Poultry may be raised with the greatest economy on large farms of the country, where there is unlimited range, an inexhaustible supply of insects and worms, and an abundance of seeds and grains going to waste which poultry alone can utilize. When fenced away from the gardens and flower beds, fowls do little damage and cause scarcely any annoyance on the farm. On the other hand, they do an immense amount of good in the protection of crops by the destruction of injurious insects and larva and worms.

Value of Fowls.—Where care can be given poultry it is always best to secure standard-bred fowls for breeding purposes, by obtaining eggs for hatching of a reliable breeder. Following is a list of the standard breeds with their characteristics:

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 most common, or barred variety, is 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 round, and in winter they lay exceptionally well. Their eggs are brown in color and average eight to a pound.

Wyandottes.—The Wyandotte is another of the general-purpose fowls and is rated next to the Plymouth Rock. They are of medium size, weighing on an average of 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 excellent broilers and roasters. As layers, they are

among the best, averaging from twelve to fourteen dozens a year, and as winter layers, they do well under ordinary circumstances.

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.

American Dominiques.—This is the oldest of the American class. It is of the color of the Barred Plymouth Rock and about the size of the Wyandotte. It is a hardy and prolific breed which is not given the attention it deserves.

Javas.—This variety is the next 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 good 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, and are good sitters and mothers, and are easily kept in confinement.

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.

Brahmas.—The leading variety of the Asiatic class is the Light Brahma. They are valuable birds for the farm; 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 setters and mothers they are fair.

The Dark Brahmas are not so popular as the Light—the difficulty being in breeding them true to feather; and for practical purposes they are not to be commended as highly as the Light.

The standard weight of Light Brahma cocks is 12 pounds; hens, $9\frac{1}{2}$ pounds; cockerels, 10 pounds, and pullets, 8 pounds. The standard weight of Dark Brahma cocks is 11 pounds; hens, $8\frac{1}{2}$ pounds; cockerels, 9 pounds, and pullets, 7 pounds.

Cochins.—The four varieties of Cochins are not very popular with breeders. They are second to the Brahmas

in the meat breeds, weighing but a pound lighter than the Light Brahma.

The Buff variety is most generally bred; the Partridge Cochin being 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.

Black Cochins are much more easily raised than are either of the varieties thus far described. A one-colored bird is the more practical bird for the farmer and market poulterer. 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, excepting cocks, which should weigh 10½ pounds.

Langshans.—Langshans are practical in more senses than one, and their prolific laying and other excellent qualities make them profitable for the farmer and market poultryman. 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. The quality of the flesh of the Langshans 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.

There are two varieties of Langshans—the Black and the White. The Black in plumage of neck, back, saddle, sickles, a glossy metallic black with greenish sheen; breast, primaries, secondaries, tail, fluff, shank, and toe feathers, black. The undercolor 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.—The Leghorn fowl holds the same place among the poultry that the Jersey holds among cattle. 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 two-thirds that of the Asiatic varieties. They mature early, feather quickly, the pullets sometimes begin laying when four months old, and cockerels crow at the same age. They are the best

layers, averaging between 150 to 200 eggs per year. Their eggs are pure white in color, and weigh about 8 to the pound. As table fowls they are fairly good, but rather small in size. Altogether, they are one of the most profitable breeds of poultry that can be kept upon the farm, and the cheapness of their keeping will allow the raising of two Leghorns for the cost of one Asiatic.

There are six varieties of Leghorns: Black, Brown, Buff, Dominique, Silver Duckwing, and White. The Brown and White are bred with both single and rose combs.

There is no standard weight given for Leghorns.

Minorcas.—The Minorcas are good for table purposes, their flesh being white or light-colored, and fine grained. Their chief advantage is their egg production. They are non-sitters and year-around layers. As winter layers they are exceptionally good when kept under favorable circumstances. While the Leghorn surpasses them in the number of eggs laid, the Minorcas' eggs are larger, frequently weighing 30 ounces to the dozen, and equal the output in bulk.

The standard weight of a Minorca cock is 8 pounds; hens, 6½ pounds; cockerels, 6½ pounds, and pullets, 5½ pounds.

Black Spanish.—White-faced Black Spanish have long been favorably known for their exceptionally fine laying qualities. The pullets are early layers, averaging from 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.

No standard weight is given for Black Spanish; they are between the Leghorns and Minorcas in size.

Hamburgs.—Hamburgs are in front rank of egg producers and are in general shape much like the Leghorns. There are six varieties of Hamburgs: The Golden-spangled, Golden-penciled, Silver-spangled, Silver-penciled, Black and White. They are all handsome 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 non-sitters. 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. They rarely lay in winter.

No standard weight is given for Hamburgs.

Houdans.—The Houdans 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 sprightly, active and feather rapidly. They are non-sitters and light feeders; like the Leghorns, they may be fed at small cost as compared with some of the larger breeds.

The standard weight of cocks is 7 pounds; hens, 6 pounds; cockerels, 6 pounds, and pullets, 5 pounds.

Orpingtons.—This breed, which originated in England a few years ago, is attracting a great deal of attention. They come in Black, White, Buff, Spangled and Jubilee varieties. The Spangled are black and white and the Jubilees have every feather black, white and red, a very curious combination. They are plump and round of body, weighing a pound more than Plymouth Rocks. They are very good layers of large eggs and excellent table fowls. The skin of all varieties except the Blacks is white. All varieties come with both single and rose combs. They are increasing very rapidly in this country.

TURKEYS:

There is no other kind of live stock that will return so large a profit to the successful producer as will poultry, and no kind of poultry is more profitable than turkeys when properly handled. They may be termed self-sustaining foragers where they have sufficient range.

Varieties.—Six standard varieties of turkeys are more or less grown in this country, viz.: Bronze, Naragansett, Buff, Slate, White, and Black. The main differences are in size and color of plumage. The Bronze and Naragansetts are the largest, the Buff and Slate the medium, and the Black and White the smallest.

Egg Laying.—The hen turkey will begin laying from the middle of March to the first of April, or earlier in the warmer localities.

Hatching.—They produce such a limited number of eggs that it is scarcely necessary to bring into use the incubator for their hatching, as the hens themselves can hatch all they lay. Chicken hens brood the poults quite as well as the turkey hens up to a certain age, at which time the poults begin to wander. If other broods of poults are with turkey hens, those with the chicken hen will usually leave their foster mother and wander away with a flock of turkeys, and stay with them.

Whether the eggs are hatched by turkey hens or chicken hens, equal caution should be used to prevent the possibility of insect parasites of any kind being in or about the nest or upon the body of the hen. After the poults have begun to grow, they must be watched continually to guard against the presence of lice.

It takes twenty-seven to twenty-nine days for turkey eggs to hatch. Those that are perfectly fresh will hatch a few hours sooner than those that have been kept a week or longer before placing them under the hens.

An open coop, made of slats or lath, may be placed over the mother turkey just prior to the hatching of her eggs, as this will prevent her wandering away with her young when they are hatched. Prior to using old coops, paint them thoroughly with crude petroleum in which have dissolved some naphthalene balls, filling every crack and crevice with this at least a week before they are needed, and be sure that the odor of the preparation has disappeared before using the coops, as it is not beneficial to the young. The features of most importance in cooping the mother and young are plenty of light and room, and freedom from dampness and insect parasites.

When the poults are ready to leave the nest, move the mother hen and her young into the coop provided for them; supply a little food now and then as they need it, and see that the mother has plenty of food and water. Let them alone in the coop till they begin to move about. As soon as they will, let the poults run out on the grass when it is dry, but keep them from the wet grass, as nothing is more detrimental to their growth unless it be insect parasites. As they advance give them a more plentiful food supply, and guard against any possibility of lice infesting them.

The young poults should be given for their first meal very fine oatmeal or finely cracked wheat or corn, with a little fine grit of some kind, and very little granulated meat scrap. Some of the commercial brand of "poultry food" are also good. They should have clean water convenient where they can help themselves at will.

As a general rule do not feed them wet food or slops. Poults are seed-eating chicks, not slop eaters. Soak stale bread in sweet milk, press out the milk as completely as possible, and feed the bread to the young poults. Be careful never to use sour milk, nor should the bread thus prepared ever be fed after it has become sour. Feed this, a little at a time, every hour or two for two days or more; then add a little hardboiled egg, shell and all broken fine to the soaked bread.

After a day or two on this ration, follow with a ration of finely broken grain as already described, and include a little finely cut meat. Lean beef, well cooked and cut into very small fragments, is good. Plenty of grit of some kind is a necessity, for without it the poults cannot grind their food.

Bowel trouble and indigestion may be prevented so far as possible by the feeding of finely broken charcoal, which is a safeguard against fermentation in the crop or gizzard, thus aiding digestion.

Poults should be taught to feed by taking the food between the fingers and thumb, patiently holding it to the beak of the young turkey, and try to induce it to eat. This method of feeding tames and quiets the young poults, gives them a good start and prevents the possible contamination of the food by being thrown on the ground.

After three weeks, the poults may have whole wheat, hulled oats, cracked corn, and a little millet seed, in addition to their other food.

One of the most successful growers in the country feeds the young poults at the start oatmeal, broken wheat, and finely cracked corn; as they grow older, whole wheat, hulled oats, and coarser cracked corn, and still later, whole grains of corn. When running at large, they are taught to come close to barns twice a day for food. Following these and similar methods enabled him to bring to maturity, during the unfavorable season of 1903, over 300 white turkeys out of about 335 that were hatched.

As soon as the weather begins to turn cold and insect food becomes scarce, a ration of wheat and corn should be provided for the growing turkeys. Keep them growing from start to finish, and have them ready for the Thanksgiving market, when prices are usually the best. This may be accomplished quite easily with all the early broods, provided they are properly and liberally fed as the fall weather begins to remove their natural food supply of worms, bugs, seeds, and herbs of all kinds.

DUCKS:

Of all kinds for farm and practical purposes, the White Pekin stands the highest. This breed is valuable for raising on a large scale, and is the most easily raised of any. It is a very timid bird and must be handled quite carefully.

In size the ducks are very large, some reaching as high as 20 pounds to the pair. Their flesh is very delicate and free from grossness, and they are considered among the

best of table fowls. They are excellent layers, averaging from 100 to 130 eggs each in a season. They are non-sitters, hardy, easily raised, and the earliest in maturing of any ducks.

The standard weight of the adult drake is 8 pounds; adult duck, 7 pounds; young drake, 7 pounds, and young duck, 6 pounds.

White Aylesbury.—These ducks are second to the popular White Pekins for market purposes, and are bred in large numbers in England and Europe. They are of large size, pairs occasionally reaching the weight of 18 pounds, the male birds weighing 9 or 10 pounds and the females 7 or 8 pounds. Birds weighing 15 to 16 pounds to the pair are the average.

Rouen.—The Rouen duck is a fine market bird, but does not mature as early as does the Pekin or the Aylesbury. The flesh is considered very delicate, and the breed is acknowledged to be superior for table purposes, being easily fattened.

The standard weight of the adult drake is 9 pounds; adult duck, 8 pounds; young drake, 8 pounds, and young duck, 7 pounds.

Black Cayuga Duck.—The Black Cayuga is distinctly an American duck. It is not, however, much raised.

The standard weight of the adult drake is 8 pounds; adult duck, 7 pounds; young drake, 7 pounds and young duck, 6 pounds.

Muscovy Ducks.—These ducks are very unsatisfactory birds to keep on the farm with other poultry, owing to their quarrelsome and pugnacious natures. When bred they must be kept in a yard by themselves, and their wings must be clipped to keep them from flying.

The standard weight of the adult drake is 10 pounds; adult duck, 8 pounds; young drake, 8 pounds, and young duck, 7 pounds.

Gray and White Call Ducks.—Call ducks are bantams, and are bred more for the fancy than for profit. Their uses are only for the show room, or as decoy ducks for wild duck shooting. For the latter purposes they are sometimes crossed with the common "puddle duck" or with the wild Mallard. This latter cross is considered excellent, the progeny being distinguished for tameness and domesticity. No standard weight is given for Call ducks.

Black East Indian Ducks.—Another standard breed hardly considered a rival of the Pekin, Aylesbury, Cayuga

or Rouen. This duck bears the same relation to those just named as does the bantam to the larger varieties of chickens. There is no standard weight given for Black East Indians; the smaller their size the higher they rank for exhibition purposes.

What is said below of geese applies also to ducks, excepting that where large numbers are kept for supplying eggs for incubators the Pekin variety is usually preferred, and can be kept without ponds if an abundance of drinking water is provided. Ducks will become lame if their quarters are damp. Cut straw, litter, or chaff may be used on the floors. When laying they should be fed twice a day as much as they will eat, as suggested for geese, but green food must also be given. When not laying they should be turned out to consume grass, having a meal only at night. Animal food is essential for geese and ducks.

Ducklings are fed entirely on soft food, consisting of cooked turnips, thickened with cornmeal, ground meat, bran, and sifted oatmeal, not too wet, four times a day. Cleanliness is essential with them, and it is a matter of dispute as to whether more than enough water to drink or not. A duckling of the Pekin variety should weigh at least 4 pounds when ten weeks old.

One drake and six ducks make a pen. Ducks will lay over 100 eggs each, beginning in January and February and finishing in a few months. Pekin ducklings sometimes weigh 5 pounds when ten weeks old, but such weights are exceptional.

GEESE:

Geese require almost no care, but should have dry quarters. Geese are fond of pasture, on which they will thrive. In winter one good meal a day, as much as they will eat, of cooked potatoes or turnips, with cut clover, ground oats, and ground meat added, will be sufficient.

Goslings should be fed three times a day the first week and twice daily thereafter until two or three weeks old, when they can help themselves on the pasture if given a light meal at night. Keep goslings from ponds until well feathered, but keep drinking water within reach. As a rule, geese instead of hens are allowed to hatch out the goslings. The young geese only should be sold, as the old ones will perform service for many years.

PIGEONS:

Grown on a large scale for their young which are marketed as squabs. Young birds are marketed at from 25 to 28 days of age.

RABBITS:

Commonly known through its habit of gnawing the bark of fruit trees in winter. Besides this the "Belgian hare craze" was but a short time ago very common throughout the country. This interest is now dying out, there being little or no market for the meat of the animals, though it is excellent for cooking.

BEEKEEPING:

Almost any one can learn to manipulate bees. With extracted honey of good quality at its present wholesale price of 6 to 8 cents per pound and comb honey at 12 to 14 cents, each hive should, under favorable circumstances, give a gross annual return of \$2.50 to \$3. From this about one-third is to be deducted to cover expenses other than the item of labor; this will include the purchase of comb foundations, repairs, eventually replacing of hives and implements and the interest on the capital invested.

Stings can be avoided (1) by having gentle bees. Of the races already in general cultivation Carniolans are the gentlest, along with Caucasians, more recently introduced from southeastern Russia and only now being put on sale (1905), are by far the least inclined to sting of any bees and may be handled at all times without resorting to the protection of a bee veil, and generally without smoking. In case these gentler races are not easily procurable the manipulation of pure Italians is recommended. To avoid stings have a good smoker at hand whenever bees are to be handled. Use the modern bellows smoker. A veil and gloves may be used at first. The gloves will probably be discarded as soon as the bees are much handled and the veil may be dispensed with if the gentlest bees are kept.

Hives.—The suspended Langstroth frame is commonly used. Factory-made hives put up by experts as a rule are the best. Another hive of quite different construction from the Langstroth is the Quinby closed-frame hive; used with great success by certain American beekeepers of long experience.

Natural Swarming.—When swarming takes place the bees will probably gather in a clump on a tree or bush near

by and it will then be a simple matter to shake them into a new hive or basket or box. If they are poured out before an unoccupied hive shaded and well ventilated the bees are almost certain to take possession at once and begin work actively. The swarm may be made to hive itself by clipping one wing of each laying queen so as to prevent her flying; when the bees start to swarm she will fall and may be secured in a cage, when the bees will return, the attendant having replaced the abandoned hive by an empty one which the bees will enter and the queen may be allowed to go in with them.

Artificial Swarming.—Where an increase of colonies is desired and in case no one can be near the apairy to care for natural swarming with clipped queens, some of the artificial methods of forming a new colony may be employed, though natural swarming is to be preferred. There are three principal methods of artificial swarming: (1), dividing; (2), the Nucleus system, and (3), shaken or brushed swarms. The second is considered the best plan. From a populous colony enough bees and combs are taken to make a fair nucleus for a new stand; a queen is introduced into this nucleus or a queen cell and is readily accepted a day or two later. As soon as the young queen has begun egg-laying, combs of emerging brood may be added from time to time; these may be obtained from any populous colony. Good wintering, the presence of a prolific queen with abundant stores for brood rearing with the prevention of swarming are the conditions necessary to bring a colony of bees to producing a goodly amount of honey.

Extracted Honey.—To secure extracted honey the requisite number of combs may be in one long hive or in stories above another. Additional stores are added when the supplies of combs already occupied by the bees are filled. Before removing combs time should be allowed the bees to ripen and cap the honey. The honey in combs that are quite or nearly sealed over may be considered sufficiently ripened to be removed from the hive. The cells are uncapped by means of a sharp knife made for this purpose, and the combs are then made to revolve rapidly in a honey extractor. Extracted honey is run into open buckets and left covered with cheese cloth to stand a week or so, being skimmed any day when it is ready for marketing.

Comb Honey.—The difference to be observed in preparing colonies for the production of comb honey instead of extracted is in the adjustment of the brood apartment at the time the supers are added. Before comb honey is

marketed it should be carefully crated and all propolis scraped from each of the sections. It is impossible to manufacture comb honey.

Wintering Bees.—To bring bees successfully through the winter in the colder sections is a problem which gives anxiety to all who are about to attempt it for the first time, and even to those who have kept bees for years.

Points to Be Noted.—Whatever method be followed in wintering, certain conditions regarding the colony itself are plainly essential: First, it should have a good queen; second, a fair-sized cluster of healthy bees, neither too old nor too young; third, a plentiful supply of good food. The first of these conditions may be counted as fulfilled if the queen at the head of the colony is not more than two years old, is still active, and has always kept her colony populous; yet a younger queen—even one of the current season's rearing, and thus but a few weeks or months old—is if raised under favorable conditions, much to be preferred. The second point is met if brood rearing has been continued without serious interruption during the latter part of the summer and the cluster of bees occupies, on a cool day in autumn, six to eight more spaces between the combs, or forms a compact cluster 8 or 10 inches in diameter. Young bees, if not well protected by older ones, succumb readily to the cold, while quite old bees die early in the spring, and others, which emerged late in the summer or autumn preceding, are needed to replace them. The third essential—good food—is secured if the hive is liberally supplied with well-ripened honey from any source whatever, or with fairly thick syrup, made from white cane sugar, which was fed early enough to enable the bees to seal it over before they ceased flying. The syrup is prepared by dissolving 3 pounds of granulated sugar in 1 quart of boiling water and adding to this 1 pound of pure extracted honey. Twenty to 25 pounds for outdoor wintering in the south, up to 30 or 40 pounds in the north, when wintered outside with but slight protection—or, if wintered indoors, about 20 pounds—may be considered a fair supply of winter food. A smaller amount should not be trusted except in case much greater protection be furnished against the effects of severe weather than is usually given. A greater amount of stores will do no harm if properly arranged over and about the center of the cluster, or, in case the combs are narrow, wholly above the cluster. In many instances it will be a benefit by equalizing in a measure the temperature in the hive, as well as by giving to the bees greater confidence in extending the brood nest in early spring.

PART V.

MISCELLANEOUS.

ADMINISTRATION OF MEDICINE:

When it is necessary to give drugs to animals they may be administered in the following ways: (1), by the mouth; (2), by injection into the tissues beneath the skin; (3), by rubbing into the skin; (4), by the air passages and lungs and (5), by the rectum.

Drenching.—This is the most common method of administration, though drugs should be administered with the feed or drinking water. In drenching horses a heavy long-necked glass bottle is to be used, a bridle being put on the head of the horse instead of a halter. A small rope is fastened to the ring on each side of the bit so as to elevate the head. If the horse refuses to swallow, drop a tablespoonful of water in the nostril, when the horse will be obliged to swallow. Cattle and sheep are easily drenched.

Balls.—Drugs which are not soluble may be given in balls made of syrup honey and linseed meal formed into a cylinder about three-quarters of an inch in diameter and a few inches in length and wrapped in tissue paper. The ball is held between the ends of the first finger and thumb, the tongue being pulled out as far as possible and held to one side with the left hand; the ball being placed on the tongue is quickly released and the head elevated.

In giving a hypodermic injection the side of the neck or shoulder is the point for inserting the needle. The needle and syringe should be thoroughly sterilized.

Liniments, plasters and poultices applied for local effect are common, drugs not being absorbed through the unbroken skin. Chloroform is occasionally administered in veterinary surgery. When the animal cannot be drenched medicine may be administered by the rectum. A fluid injection is used for different purposes as to hasten the action of a purgative, to kill an intestinal parasite and occasionally to supply food.

Dose.—The doses given in the table on page 135 are for adult animals; for a colt a year old about one-third the quantity is given; two years, one-half; three-year-olds, two-thirds.

(130)

Bot Flies.—These are very important because the larva is a parasite in different species of domestic animals. These flies may be seen about animals depositing their eggs in places where they can readily gain access to the proper part. It is transferred to the stomach of the animal by the mouth and fixes itself on the walls of that organ and when hatched and fully developed loosens its hold.

Unless there are a large number in the stomach they are not very harmful, being injurious only to old and poorly cared for or young horses by irritating the stomach and causing irritation of the intestinal canal. The treatment is principally preventive, consisting of destroying the eggs by washing the infested parts with a 2 or 3 per cent solution of carbolic acid or by bathing slightly with kerosene.

INSECTIDES:

Arsenical Poisons for Biting Insects.—Paris green, London Purple, Scheele's Green, Paragrene and Green arsenoid are all arsenic poisons of the same general character. Paris green is made of arsenic, copper and acetic acid; Scheele's green is similar, but contains no acetic acid, is more easily applied, and, like Paragrene remains in suspension longer; London purple and Paragrene need more lime added to prevent foliage burns.

For Spraying.—Make a thin paste of the poison used by adding a small portion of it to a small quantity of water, afterward adding an equal amount of slaked lime. Strain this into a spray tank, and add water in the proportion of 100 to 300 gallons to each pound of poison. Apply the stronger mixtures to foliage which is not easily damaged, such as the potato. For the apple, use 150 gallons to each pound of poison.

For Dry Use.—For vegetables soon to be used as food mix poison with 100 times its weight of plaster of Paris, flour or lime, and apply lightly. Dust garden crops with poison from a bellows or bag. For low field crops, place in bags hung at the end of a pole and carry through field on horse back.

Combined Mixture.—(Bordeaux with Paris green or other arsenite.)—Prepare Bordeaux mixture in the usual way and add to it the poison to be used. In this combination Bordeaux mixture takes the place of water in the Paris green and other arsenical solutions. A recipe for Bordeaux mixture will be found on page 46.

PLANTING TABLE

NAME	Rows *	Rows or Drills †	Quantity per Acre
Alfalfa			20 to 30 lbs.
Artichokes	15	36	6 to 7 bu.
Barley	Drilled		8 pecks.
"	Broadcast		10 pecks.
Beans, field, for forage			2 bu.
" soy, for forage		26 to 30	3 to 4 pecks.
" soy, for seed		26 to 30	2 to 3 pecks.
" velvet, for forage		26 to 30	1 to 2 bu.
Beets, for stock	In Drills	26 to 30	5 to 15 lbs.
" for sugar	In Drills	26 to 30	2 to 3 pecks.
Buckwheat			4 to 6 lbs.
Carrots	In Drills		7 lbs.
Clover, Alsike	Alone		10 lbs.
" red	Alone		8 lbs.
Corn, field, for grain	42 to 48	42 to 48	2 to 3 pecks.
" " for forage	In Drills	30 to 36	3 to 4 pecks.
" " " " " "	Broadcast		2 to 3 pecks.
Cow-peas, for seed			4 to 6 pecks.
" for forage			8 pecks.
Emmer	Drilled		10 pecks.
" " " " " "	Broadcast		2 to 3 pecks.
Flax	Drilled		30 lbs.
Grass, blue	Alone		45 lbs.
" brome, smooth			25 lbs.
" meadow fescue			30 lbs.
" orchard			9 lbs.
" red top			30 lbs.
" rescue			35 lbs.
" tall fescue			6 lbs.
" tall oat			7 to 10 lbs.
" timothy			4 to 5 pecks.
Kafir-corn, for grain		36 to 40	2 lbs.
" for forage			4 to 6 pecks.
Kohlrabi	Drilled		4 to 5 pecks.
Macaroni wheat, spring seeding	Drilled		4 to 5 pecks.
" " fall seeding	Drilled		4 to 5 pecks.
Millot	Broadcast		6 pecks.
" " " " " "	Drilled		6 pecks.
Milo maize	Broadcast		8 pecks.
" " " " " "	Drilled		8 pecks.
Oats	Broadcast		10 pecks.
" " " " " "	Drilled		2 to 3 bu.
Peas, field			3 bu.
Peas and oats, for forage			6 to 10 bu.
Potatoes	10 to 18	30 to 36	5 lbs.
Pumpkins, alone	96	96	8 pecks.
Rape			2 lbs.
Rutabagas	In Drills		4 pecks.
Rye, for grain	Drilled		5 pecks.
" " " " " "	Broadcast		6 pecks.
" for forage			75 to 100 lbs.
Sorghum, for forage	Drilled		100 to 125 lbs.
" " " " " "	Broadcast		2 lbs.
Turnips	In Drills		4 lbs.
" " " " " "	Broadcast		1 bu.
Vetch	Drilled		4 to 5 pecks.
Wheat	Drilled		5 to 6 pecks.
" " and Hairy Vetch, for forage	Broadcast		4 to 6 pecks.

* Distance apart in inches.

PROPAGATION AND PLANTING TABLE

NAME	AVERAGE PLANTING DISTANCE	HOW MULTIPLIED	STOCKS COMMONLY USED
Apple	33 to 40 feet.	Seeds, budded or grafted seedlings	Seedlings, Douchn, crab or wild crab; for dwarfs, Paradise stock
Apple, dwarf	10 to 15 "		
Apricot	16 to 30 "	See peach	Apricot in deep, rich soil; plum in cold regions, peach in mild.
Almond	20 to 24 "	Seedlings, budding	Peach, plum, hardshell almond.
Blackberry	4x7 to 6x9 ft.	Suckers, root-cuttings, tip layering	
Cherry, sour	16 to 20 feet.	Seedlings, budded	Seedlings, Mazzard st'ks, Mahaleb for sweet and dwarf sorts; Morello seedlings and wild pin cherry for hardy stk.
Cherry, sweet	20 to 30 "		
Cranberry	1 or 2 "	Layering	
Currant	4x6 "	Cuttings, layering	
Fig	20 to 40 "	Hard or soft wood cuttings	
Gooseberry	6x8 "	Cuttings, layering	
Grape	6x8 to 8x12 ft.	Hardwood cuttings, layerings	
Mulberry	25 to 30 feet	Budded seedlings, hardwood cuttings	Downing stock in South, Russian seedlings for ornamental sorts.
Nectarine	13 to 20 feet	Seedlings, budding	
Orange	18 to 30 "	Seeds, budded or grafted, seedlings	Seedlings.
Orange, dwarf	10 to 12 "		
		A Florida plan is to bud cuttings from ¼ to ½ inch in diameter and 12 inches long, place in box and cover lightly with earth. Cuttings from roots transplanted.	
Peach	18 to 20 "	Seeds, budded seedlings	Seedlings, plum stocks for damp soils and for dwarfs.
Pear, standard	20 to 30 "	Seeds, budded or grafted seedlings	Seedlings, quince for dwarfs.
Pear, dwarf	12 to 18 "		
Pecan	20 feet	Seedlings	
Persimmon, Jap.	30 to 25 feet	Budded or grafted seedlings	Native Persimmon.
Plum	16 to 20 "	Seeds, budded seedlings; also root-grafting or top-grafting	Myrabolan seedlings, Chickasaw seedlings, peach.
Quince	8 to 14 "	Cuttings, grafted	Seedlings, fine varieties grafted on Angers stock, sometimes root-grafted on apple but when scion has rooted, apple root should be cut away.
Raspberry, black	3x6 to 5x8 ft.	Layering	
Raspberry, red	3x6 to 5x8 "	Suckers, root cuttings	
Strawberry	1x3 to 3x4 "	Runners	

GESTATION CALENDAR
Average period of gestation with horses, 337 days; cattle, 283 days; swine, 113 days; sheep, 148 days.

DATE OF SERVICE	DATE ON WHICH ANIMAL IS EXPECTED TO GIVE BIRTH			DATE OF SERVICE	DATE ON WHICH ANIMAL IS EXPECTED TO GIVE BIRTH		
	Mare	Cow	Sow		Mare	Cow	Sow
January 1	Dec. 7	Oct. 8	April 23	July 5	April 17	Oct. 25	Nov. 29
" 11	" 13	" 18	" 27	" 15	" 11	" 30	Dec. 4
" 16	" 17	" 23	May 7	" 20	" 22	Nov. 9	" 14
" 21	" 22	" 28	" 12	" 25	" 27	" 14	" 19
" 26	" 27	" 33	Nov. 7	" 30	May 2	" 19	" 24
February 5	Jan. 31	" 17	" 27	August 4	" 17	" 29	Jan. 3
" 10	" 10	" 17	June 1	" 9	" 17	Dec. 4	" 13
" 15	" 16	" 22	" 11	" 14	" 22	" 9	" 18
" 20	" 21	" 27	" 16	" 19	" 27	" 14	" 23
" 25	" 26	" 32	Dec. 2	" 24	June 1	" 14	" 28
March 7	Feb. 26	" 13	" 29	" 29	" 16	" 20	Feb. 7
" 12	" 13	" 20	" 27	September 8	" 16	" 22	" 14
" 17	" 18	" 24	July 2	" 13	" 21	" 26	" 18
" 22	" 23	" 30	" 11	" 18	" 20	" 25	" 22
" 27	" 28	" 34	Oct. 2	" 23	July 1	" 13	" 17
April 6	Mar. 25	" 12	" 19	October 3	" 6	" 13	" 21
" 11	" 12	" 19	Aug. 1	" 8	" 11	" 18	" 26
" 16	" 17	" 24	" 27	" 13	" 14	" 21	" 28
" 21	" 22	" 29	Feb. 1	" 18	" 19	" 26	" 31
" 26	" 27	" 33	" 27	" 23	" 24	" 31	Aug. 5
May 10	April 29	" 16	" 24	November 7	" 29	" 31	" 17
" 15	" 16	" 23	Oct. 1	" 13	" 20	" 25	" 22
" 20	" 21	" 28	" 11	" 18	" 24	" 29	" 27
" 25	" 26	" 32	" 20	" 23	" 31	" 30	Sept. 4
June 10	May 29	" 16	Sept. 5	December 7	" 15	" 22	" 19
" 15	" 16	" 23	Oct. 5	" 13	" 14	" 21	" 28
" 20	" 21	" 28	Nov. 5	" 18	" 19	" 26	" 31
" 25	" 26	" 32	Dec. 5	" 23	" 24	" 31	Oct. 2
July 10	June 29	" 16	Jan. 6	" 28	" 29	" 36	" 14
" 15	" 16	" 23	" 15	" 30	" 31	" 38	" 19
" 20	" 21	" 28	Feb. 14	" 33	" 34	" 41	" 24
" 25	" 26	" 32	Mar. 14	" 38	" 39	" 46	" 29
" 30	" 31	" 37	Apr. 13	" 43	" 44	" 51	" 34
August 10	July 29	" 16	May 13	" 48	" 49	" 56	" 39
" 15	" 16	" 23	" 22	" 53	" 54	" 61	" 44
" 20	" 21	" 28	" 31	" 58	" 59	" 66	" 49
" 25	" 26	" 32	June 10	" 63	" 64	" 71	" 54
" 30	" 31	" 37	" 19	" 68	" 69	" 76	" 59
September 10	August 29	" 16	" 28	" 73	" 74	" 81	" 64
" 15	" 16	" 23	" 37	" 78	" 79	" 86	" 69
" 20	" 21	" 28	" 46	" 83	" 84	" 91	" 74
" 25	" 26	" 32	" 55	" 88	" 89	" 96	" 79
" 30	" 31	" 37	" 64	" 93	" 94	" 101	" 84
October 10	September 29	" 16	" 73	" 98	" 99	" 106	" 89
" 15	" 16	" 23	" 82	" 103	" 104	" 111	" 94
" 20	" 21	" 28	" 91	" 108	" 109	" 116	" 99
" 25	" 26	" 32	" 100	" 113	" 114	" 121	" 104
" 30	" 31	" 37	" 109	" 118	" 119	" 126	" 109

NAME OF DRUG	ACTION AND USE	DOSE	ANTIDOTE
Aloes	Laxative and Tonic	½ to 1 oz	
Alum	Astringent	2 to 3 drs	
Anise Seed	Aromatic and Stomachic	½ to 2 oz	
Aqua Ammonia	Stimulant and Antacid	1 to 4 drs	Vinegar
Arsenic	{ Alterative and Tonic. For Paralysis, Mange, etc.	1 to 5 grs	Magnesia and oil
Asafetida	Anti-spasmodic, Coughs, etc.	1 to 3 drs	
Bicarbonate of Potash	{ Diuretic and Antacid. For Rheumatism.	3 to 5 drs	{ Vinegar and raw Linseed oil
Bismuth	For Chronic Diarrhea, etc.	½ to 1 oz	{ Infusion of oak bark. Give also Linseed oil
Black Antimony	Promotes the Secretions	¼ to ½ dr	Eggs, Milk, etc.
Blue Vitriol	Astringent and Tonic	½ to 1 dr	Eggs and Milk
Calomel	Cathartic	10 to 40 grs	
Camphor	Anti-spasmodic	½ to 1 dr	
Cantharides	Diuretic and Stimulant	3 to 6 grs.	
Carbolic Acid	Externally and Disinfectant		Eggs, soap, gruel
Castor Oil	Cathartic	½ to 1 pt	
Cayenne	Stimulant and Carminative	5 to 25 grs	
Chlorate of Potash	Diuretic. For Bloating, etc.	½ to 2 drs	
Coppers	Tonic and Astringent	½ to 1½ drs	
Croton Oil	Powerful Purgative	10 to 15 d'ps	Opium
Digitalis Leaf	Sedative and Diuretic	10 to 20 grs	Stimulate
Epsom Salts	Cathartic and Febrifuge	2 to 8 oz	
Either	Anti-spasmodic	½ to 2 oz	{ Hydrated Per- oxide of iron
Fowler's Solution	Used for Skin Diseases	1 to 4 drs	
Gentian Root	Tonic	1 to 2 drs	
Ginger	{ Tonic, Stimulant & Stom- achic. For Flatulent Colic, Dyspepsia, etc.	2 to 5 drs	
Glauber's Salts	Cathartic	6 to 12 ozs	
Iodide of Potassium	{ Diuretic and Alterative. For Rheumatism, Dropsy, Enlarged Glands, etc.	½ to 1½ drs	{ Give freely starch or flour, with water
Linseed Oil, Raw	Cathartic and Nutritive	1 to 2 pts	
Magnesia	{ For colic as an Antacid and Laxative	¼ to 1 oz	{ Whites of eggs with milk
Mercurial Ointment	For Mange, Itch, Lice and other Parasites		{ Salaratus, fol- lowed quickly by coppers, dis- solved in water
Nux Vomica	Nervous Stimulant. For Paralysis	15 to 25 grs	
Opium	Anodyne and Anti-spasmodic. Given in Colic, Inflammation of Bowels, Diarrhea, etc.	¼ to 1 dr	{ Belladonna, strong coffee, brandy and am- monia. Dash on cold water, keep horse moving
Prepared Chalk	Antacid	¼ to 1 oz	
Quinine	Tonic. During Convalescence	15 to 50 grs	{ Linseed oil largely, raw
Saltpetre	Diuretic and Febrifuge	1 to 3 drs	
Soda Bicarb	Similar to Bicarb. Potash	3 to 8 drs	
Soda Sulphite	{ Antiseptic and Alterative. For Blisters	½ to 1 oz	
Solution of Lime	Antacid, an antidote to poisoning by acids	4 to 6 ozs	
Sp'ts of Chloroform	Anodyne and Anti-spasmodic	1 to 2 ozs	
Strychnia	{ Tonic and Stimulant. For Paralysis	½ to 1 gr	Tobacco
Sulphur	{ Alterative and Laxative. Skin Diseases, Rheumatism	½ to 2 oz	
Sweet Sp'ts Nitre	Diuretic and Diaphoretic	½ to 1½ oz	
Tannic Acid	Astringent	20 to 40 grs	Tannic Acid
Tartar Emetic	Sedative and Alterative	½ to ½ dr	{ Small doses of Nux Vomica, stim'n'ts large- ly, keep moving
Tin. Aconite Root	Sedative. For Lung Fever, etc.	15 to 35 d'ps	
Tin. Cantharides	Stimulant and Tonic	1 to 2 drs	
Tincture Ergot	Parturient	1 to 2 oz	
Tincture Iodine	Used externally		
Tincture Iron	{ Tonic and Astringent. For Typhoid Diseases	½ to 1 oz	
Tr. Nux Vomica	Tonic. Stimulant in Paralysis and Dyspepsia	2 to 4 drs	See Nux Vomica
Tincture Opium	Anodyne and Anti-spasmodic	1 to 2 ozs	See Opium
White Vitriol	{ Astringent. For Wounds, Cuts and Sores, in solution	5 to 15 grs	Milk, eggs, flour

For a colt one month, give one twenty-fourth of the full dose for an adult horse as given above; three months old, one-twelfth; six months old, one-sixth; one year old, one-third; two years old, one-half; three years old, three-fourths.

DATA REGARDING BREEDING

ANIMAL	Age to begin Breeding	Duration of Heat	Interval between Heats	Period of Gestation or Incubation	Return for Breeding after Parturition	Useful for Breeding
	Years	Days	Days	Days	Days	Years
Horse...	4	5-7	21-28	337-419	7-10	10-12
Cow ...	3	2-4	21-28	285-326	21-28	10-12
Hog ...	1	2-4	17-28	104-127	35-42	6
Sheep...	2	1-2	9-12	143-160	120-180	6
Goat....	2	1-2	.....	148-162	120-180	6
Rabbit..	$\frac{1}{2}$ to 1	.....	.....	30	.....	5-8
Hen.....	1	.....	.....	21	.....	3-5
Turkey..	1	.....	.....	28	.....	10
Guinea..	1	.....	.....	25	.....	10
Duck....	1	.....	.....	28-35	.....	10
Goose...	1	.....	.....	30-35	.....	10
Dog.....	2	.....	.....	55-70	.....	8
Cat.....	1	.....	.....	48-60	.....	6



Just a Minute

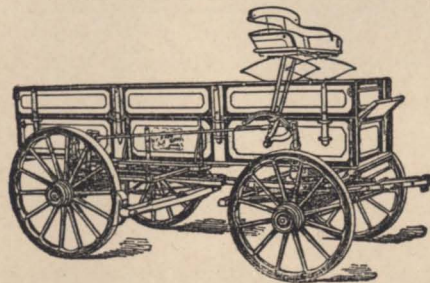
of your time, to explain to you a few points:

The Holmes Patent Straight-Bearing Skein, extra heavy, Hickory Axles, Oak Hubs, Spokes and Felloes, Oak Reaches, Poles, etc. Popular Boxes and Long Leaf Yellow Pine Bottoms are all found only on the wagon manufactured by the

Fish Bros. Wagon Co., Racine, Wis.



Be sure you have the Trade Mark as given above on your wagon.



Fish Bros. Wagon Co.,
RACINE, WIS.

When Buying a New Buggy

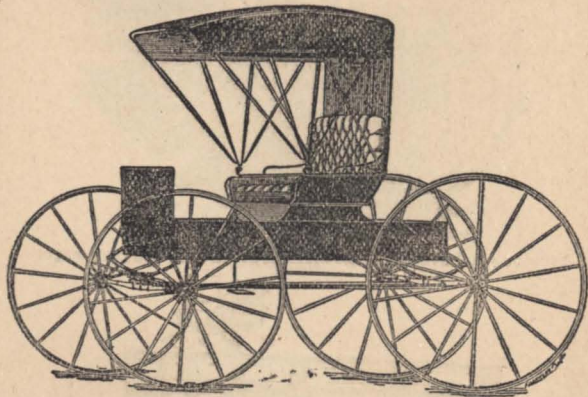
Look for these Special Features :

STAYER LONG DISTANCE AXLES. No rattle. Dust-proof, light running, noiseless. Furnished with set screws in axle nuts to take up wear on washers.

OPEN SPRING CUSHIONS, with 15 springs. Solid foot dash.

STAYER PATENT 5th WHEEL, with concealed head clipped king bolt. Never breaks, never works loose or rattles. Steel stay braces.

IMPROVED CLOSED HEAD SPRINGS. Four leaf front and rear, with French point leaf s. Graded, oil tempered, very elastic, will not break.



THE STREATOR TOP ATTACHMENT, adds \$10.00 to the value of a buggy: Used only on Stayer Buggies. Lifting a lever at right hand of seat lowers the top (this can be done with side curtains on). When standing on ground you can drop the top back by breaking a joint on either side, as opposite joint works at the same time.

The Streator Top Attachment prevents wrenching or straining the top as both joints must be folded at the same time, therefore, adds to the life of the buggy. Send for 92-page catalogue.

STAYER CARRIAGE CO., Chicago.

THE BEST FARMER

You may sometimes judge how good a farmer is by the way his buildings look, as well as by the crops he gets.

Put some money into Devoe Lead & Zinc Paint; then put the paint on your house or barns.

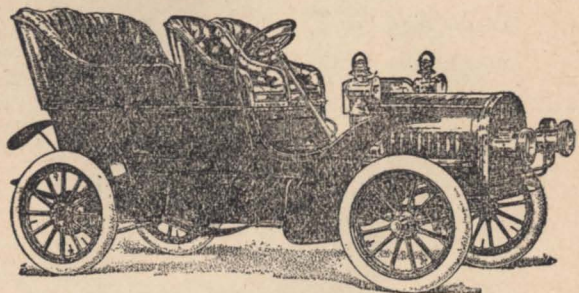
You'll be satisfied with the looks, and wear; the economy of paint.

Next potato season remember C. T. Raynolds & Co.'s Paris Green; ask your dealer for it. The bugs don't like it.

DEVOE & RAYNOLDS CO.

72 RANDOLPH STREET CHICAGO
FULTON AND WILLIAM STREETS NEW YORK
1214 GRAND AVENUE KANSAS CITY

Rambler



Surrey, Type One. \$1,200.

A car for general utility and hard steady travel over any passable roads.

The ideal car for touring and country service.

Equipped with the most mechanically simple and reliable power plant ever placed in a car of this type.

One hand motor control with no complication of levers, clutches, universal joints, etc., etc.

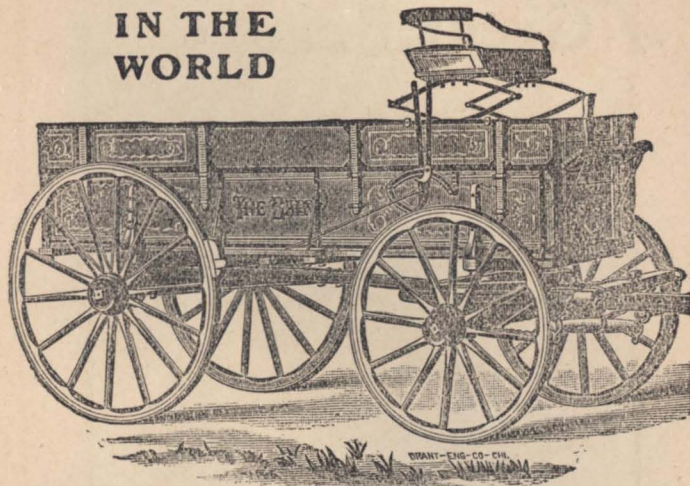
The Anti-Repair Shop Car

One of seven models, all described in our catalog which will be mailed upon request. Address

Thos. B. Jeffery & Co.

KENOSHA, WIS.

THE BEST WAGON IN THE WORLD



The Bain Wagon

Fifty-third Year

Many a Bain Wagon is being used today by the grandson of the man who bought and first used it.

Over fifty years of wagon building has enabled us to make—not the cheapest—but the best—and the best is always the cheapest in the end.

Every Bain Wagon is made by day labor—not on the jobbing principle.

Before setting of tires the felloes are all run through boiling Linseed oil, which prevents shrinkage and loosening of tires.

A strong **Written Guarantee** goes with every wagon. Ask for further information. Address

THE BAIN WAGON CO., Ltd.
KENOSHA, WISCONSIN.

Unique Finishes of Great Beauty

FLORSATIN

Is an absolutely unique floor finish. It is easily applied, has all the beauty of wax finish, but is not slippery and and is very durable. Send for free booklet, "A Prescription for Floors."

DEAD-LAC

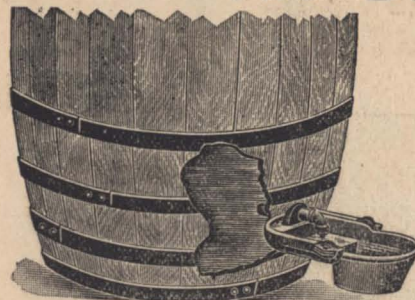
Is a very remarkable Varnish for residence interiors. It dries with a soft, lustreless effect, bringing out all the beauty of the grain. Over stains it gives a wonderfully handsome effect, and has become popular. Send for free booklet, "Dead-Lac Facts."

Correspondence solicited.

Chicago Varnish Company
(Established 1865)

35 DEARBORN AVENUE, CHICAGO
22 VESEY STREET, NEW YORK

3 Famous Bargains

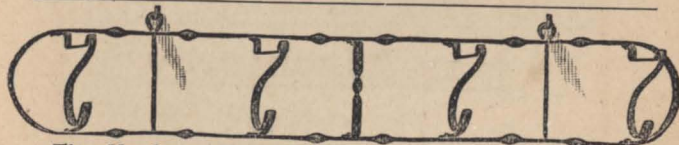
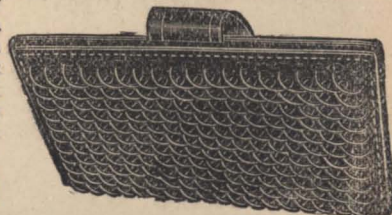


For 75c we will send you one of our **Victor Stock Fountains**—the most simple and reliable device for watering stock ever invented. Its action is automatic—it is heavily built and is practically indestructible—it has an inside filter which keeps sediment and impurities from the basin—it has

no springs or small parts to get out of order. Weight, 5 lb. We could not improve it if it cost five times its price. Get one now.

The New Idea Curry

Comb. As flexible as a rag—more effective than the old metal ones. It adapts itself to any part of the horse—it removes mud and scurf without irritating the most sensitive skin—it is comb and brush combined. It is in use in the most exacting stables. Sent postpaid for 25c.

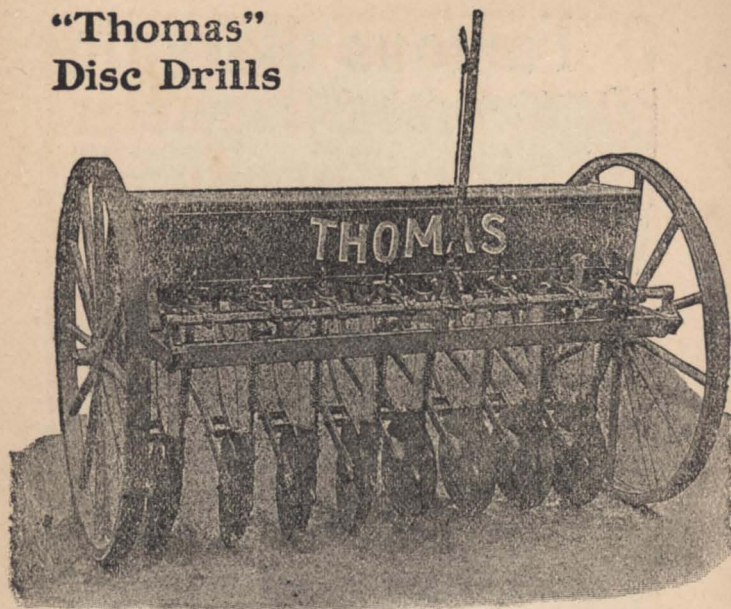


Five Hooks on Two Nails. This rack is made of 5-16 steel and is built for hard service. It is beautifully finished in oxidized copper and will add to the appearance of any home. Length 21 inches. Send us 35c and we will send one with five hooks—the cut shows but four.

We have made hardware specialties for 25 years.

ARCADE MFG. CO., Freeport, Ill.

"Thomas" Disc Drills



Disc, Hoe and Shoe Drills

Plain and Fertilizer Drills

Hay Machinery

Harrows

"Thomas" Goods are Standard

Made only by
THE THOMAS MFG. CO.
SPRINGFIELD, OHIO.

Send for free circular.

THE IMPROVED U. S. Cream Separator WON GOLD MEDAL

THE HIGHEST AWARD
LEWIS AND CLARK EXPOSITION, Portland, Ore.

All the milk of the several breeds of cows tested at this Exposition was run through the United States Separator.

U. S. SEPARATOR received Highest Award at the World's Columbian Exposition, Chicago, 1893.

U. S. SEPARATOR received Gold Medal at the Paris International Exposition, 1900, the highest award given to any separator manufactured in the United States.

U. S. SEPARATOR received Gold Medal, the highest award, at the Pan-American Exposition, 1901.

U. S. SEPARATORS have received Gold Medal, or Highest Award at every International Exposition at which they have been exhibited and tests of Separators have been held.

Since the PAN-AMERICAN EXPOSITION in 1901, the U. S. Separator has held the

World's Record for Clean Skimming.

The U. S. SEPARATOR

Continues to maintain undisputed right to the title of

The Best Cream Separator.

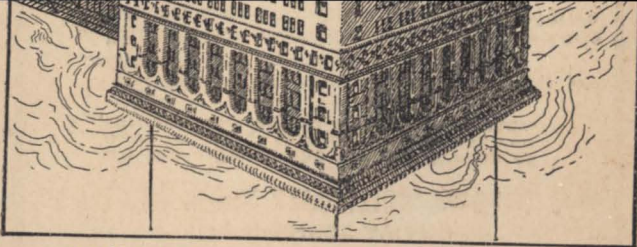


These facts concern every cow owner who is in the market for a cream separator. To all such our free catalogue, telling all about the U. S. Separator, should be equally interesting. A copy is free for the asking. Address

VERMONT FARM MACHINE CO.
BELLOWS FALLS, VT.

Prompt Deliveries from 18 Distributing Warehouses throughout the United States and Canada.

6 bu. pecan shells	4-8 bu. 9-12 bu. 15-60 lb. bu.	12-60 lb. bu.	8-10 bu.	10 bu.	1-2 bu. alone	mixed 1-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	2 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	2 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone
1 bu. pecan shells	1-2 bu. 4-6 lb. 2-4 lb. 1-1 1/2 bu.	1-2 bu. 3 lb. 1-1 1/2 bu.	1 1/4 bu.	1 1/4 bu.	8 qts.	1 1/4-2 bu. alone



ESTABLISHED 1864

Commercial National Bank
of Chicago, Ill.

Capital \$2,000,000
Surplus & Undivided Profits 1,700,000
Deposits, Dec. 1905 36,000,000

FIELD SEEDS.

The Kemper-Paxton Mercantile Co., of Kansas City, Mo., offer below **Field Seeds** mostly in demand at this season, but are in position to fill orders for any kind of seed promptly, at **lowest wholesale prices**, and of a quality equal to any of same grading on the market at all times. Quotations on seeds are sometimes made that may look enticing, but experience has proved that in purchasing seeds the responsibility of the firm offering the same should be considered. We are not dependent upon our seed business only for your patronage, and we use unusual care to fill orders with best possible quality on each grade we offer, realizing that a slight difference in cost to us may mean a vast difference in quality, and cause you a considerable loss.

The germination of all grades and varieties of seeds offered for sale by us has been carefully tested and we always appreciate our customers' advice regarding development of the same. We quote various grades on each variety, but recommend the best grade, at all times, as being the cleanest and showing the best growing results. Difference in grading generally means that the better grades are more thoroughly cleaned, show a smaller percentage of infertile seeds, and are not mixed with foreign seed, weeds, waste or dirt, and which are also true to name and variety, as ordered by you.

PRICES ON SEEDS ARE SUBJECT TO MARKET CHANGE, in nearly all lines, as the seed market fluctuates daily. Our quotations represent the general market at present, and can be depended upon as a guide generally, but when in market for seeds, send us your order and we will give you the benefit of decline at all times.

Quotations are per 100 lbs. and bushel lots, and an additional charge for sacks of 5 cents each is made. We charge only for actual sacks used, as quantity of seeds packed in sacks varies with each kind. Weight marked in circle represents number of pounds per bushel on each grade of seed.

	Per 100 lbs.	Per Bu.
Red Clover, prime.....(60 lbs.)	\$14.50	\$8.75
Red Clover, choice.....(60 lbs.)	15.25	9.20
Red Clover, fancy.....(60 lbs.)	16.00	9.65
Mammoth Clover.....(60 lbs.)	15.00	9.00
Alfalfa, prime.....(60 lbs.)	14.95	9.00
Alfalfa, choice.....(60 lbs.)	15.25	9.20
Alsike, choice.....(60 lbs.)	15.25	9.20
White Clover, prime.....(60 lbs.)	14.95	9.00
Crimson Clover, prime.....(60 lbs.)	10.20	6.15
Kentucky Blue Grass, fancy (14 lbs.)	15.00	2.15
Timothy, prime.....(45 lbs.)	5.30	2.40
Timothy, choice.....(45 lbs.)	5.50	2.50
Red Top, fancy.....(14 lbs.)	11.00	1.60
Orchard Grass, prime.....(14 lbs.)	11.50	1.65
Orchard Grass, choice.....(14 lbs.)	12.50	1.80
English Blue Grass, fancy.....(22 lbs.)	8.00	1.85
Johanson Grass.....(25 lbs.)	5.50	1.40
Bromus Inermis.....(14 lbs.)	11.00	1.60

(Continued on other side.)

Alfalfa	29 lb.		20-25lb	20 lb.		18-30lb	15-20lb	25 lb.		20 lb.	15-20lb	20 lb.	15 lb.
Alsike	5 lb.		2 1/2-3	5 lb.		5-8 lb	6-10lb	25 lb.		20 lb.	10-12lb	20 lb.	15 lb.
Barley	2 1/2 bu.		bu.	bu.		1 1/2-3	1 1/2 bu.	1 1/2 bu.		2 bu.	2 bu.	2 bu.	1 1/2 bu.
Buckwheat	1 1/2 bu.		1/8 bu.	1/8 bu.		1 1/2 bu.	1/8 bu.	1/8 bu.		1 bu.	1-7 bu.	1-7 bu.	1/8 bu.
Corn	1-7 bu.		1/8 bu.	1-7-1/8 bu.		1 1/2 bu.	1/8 bu.	1/8 bu.		1 bu.	100 lb.	grains	1/8 bu.
Corn, Kaffir													
Corn, Boom													
Clover	10 lb.		12 lb.	7 1/2 lb.		6-10 lb.	8-12 lb.	1 p.k.		1 bu.	50-75lb	12 lb.	7 lb.
Cotton								1/2 gal.		1 bu.	16-24lb		5 lb.
Corn, Pop.								1/2 gal.		2-3 qt.	2-3 qt.		7 lb.
Grass, Blue	2 bu.			1-1 1/4 bu.		1-3 bu.	1-2 bu.	3 pks.		4-8 qt.	50-100lb		100 lb.
Millet	2 1/2 bu.			1 1/2-3 bu.		1 1/2-3 bu.	1-2 1/2 bu.	2 bu.		50-100lb	7 pk.		2-2 1/2 bu.
Oats				1 1/4 bu.		1 1/4-2 bu.	1-2 1/2 bu.	2 bu.		2 1/2 bu.	9 pk.		100 lb.
Potatoes	1 1/4 bu.	8-10 bu.	10 bu.			4-8 bu.	9-12 bu.	6 bu.		7-10 bu.	1 1/2-2 bu.		600 lb.
Peas, Field						1 1/4-2 bu.	15-60lb	peck		1 1/2-2 bu.	7 bu.		
Peanuts								gallon					
Peas, Cow	1 1/2 bu.		1 1/4 bu.	1 bu.		12-60lb	15-60lb	peck		1 1/2-2 bu.	6-10 pk		
Rye	2 1/2 bu.					3/4-1 bu.	3/4-1 1/2 bu.	1 bu.		1 1/2 bu.	1 1/2 bu.		
Red Top	4 lb.		4 lb.			1-2 bu.	1-2 bu.	1/2 bu.		1 1/2 bu.	1 1/2 bu.		
Rape						4-6 lb.		4 lb.					
Sugar Beets				1-2		2-4 lb.		1 1/2 bu.		1 bu.	15-20lb		1-2 bu.
Sorghum						1-1 1/2 bu.				100 lb.			
Timothy	8 lb.	alone	8 qts.	1/4 bu.	2 qts.	8-12 lb.				4-8 qt.	4 qts.		10 lb.
Tobacco		20 lbs.											
Turnips		with								plants	3,500		
Vetch	1 1/4 bu.	clover	1 3/4-2	1 1/4 bu.		1/4-1/2	3-6 lb.	15-60lb		10-16qt	6 pk.		
Wheat		6 lbs.				30-40lb	1-2 1/4	3 pks.		1 1/2-2 bu.			

for order

FIELD SEEDS.

Commercial National Bank of Chicago, Ill.

ESTABLISHED - - - - 1864

Capital - - - - - \$2,000,000
 Surplus & Undivided Profits - - - - - 1,700,000
 Deposits, Dec. 1905 - - - - - 36,000,000



New Home of Commercial National Bank of Chicago
 To be Built and Owned by
 Commercial National Safe Deposit Co.

WE WANT one good bank as a correspondent in every city and town in the West, North, Northwest, South and Southwest.

The Kemper-Raxton Mercantile Co., of Kansas City, Mo., offer below Field Seeds mostly in demand at this season, but are in position to fill orders for any kind of seed promptly, at lowest wholesale prices, and of a quality equal to any same grading on the market at all times. Quotations on seeds are sometimes made that may look enticing, but experience has proved that in purchasing seeds the responsibility of the firm offering the same should be considered. We are not dependent upon our seed business only for our patronage, and we use unusual care to fill orders with best possible quality on each grade we offer, realizing that a slight difference in cost to us may mean a vast difference in quality, and cause you a considerable loss.

The germination of all grades and varieties of seeds offered for sale by us has been carefully tested and we always appreciate our customers' advice regarding development of the same. We quote various grades on each variety, but recommend the best made, at all times, as being the clearest and the same.

