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THE JOURNAL OF AGRICULTURE AND HORTICULTURE

VOL. 2. No. 14 — This Journal replaces the former "Journal of Agriculture," is delivered free to all members of Farmers' Clubs. — JANUARY 15, 1899

--THE--

Journal of Agriculture and Horticulture

THE JOURNAL OF AGRICULTURE AND HORTICULTURE is the official organ of the Council of Agriculture of the Province of Quebec. It is issued Bi-monthly and is designed to include not only in name, but in fact, anything concerned with Agriculture and Stock-Raising, Horticulture &c. All matters relating to the reading columns of the Journal must be addressed to Arthur R. Jenner Fust, Editor of the JOURNAL OF AGRICULTURE AND HORTICULTURE, 4 Lincoln Avenue, Montreal. For RATES of advertisements, etc., address the Publishers

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Notes by the Way.

The Dairy School at St. Hyacinthe.—We regret to hear that the list of applicants for the English Course of instruction at the dairy school of the province is by no means full; in fact, to use out informant's words, "applicants are very few." This neglect of such a very capital opportunity of learning a most useful trade is nothing less than astonishing. Nothing can be fuller or more thoughtfully constructed than the programme of the institution, q. v. :

This programme comprises three principal parts:

1st. Teaching of the best methods of

Milk production, both in winter and summer;
Butter-making and cheese-making;
And milk testing.

2nd. Preparation of inspectors for syndicates of butter and cheese-factories, organized or to be organized.

3rd. Experimental test of the new types of machinery and apparatus for dairies and of the new methods of manufacturing dairy products, and investigation on progress to be made in dairying.

OPENING OF THE COURSES.

The opening of the "regular course" of teaching will take place on the 21st November 1898.

Teaching.

The teaching will be free to all members of the Dairy Association of the Province of Quebec, for 1899.

There will also be a regular course of instruction in English, from January 30th to February 11th, for such students as have been already employed as makers, or have, at any rate, had some little experience in a factory.

Escape of ammonia.—Some years ago, we took the trouble to consult the well known analytical chemist, Dr. Girdwood, of McGill College, as to the use of sulphate of lime (plaster) in stables to arrest the escape of ammonia from the dejection of the animals. Dr. Girdwood held our opinion : that the two dry substances, plaster and dung, were not likely to exercise much mutual action.

He recommended a plentiful use of good dry, rich mould, as being much more likely to prove beneficial ; besides, as he said, it costs next to nothing, and can always be had, for the mere trouble of carting. As we had used this largely, both here and in England, we had no hesitation in recommending its practical employment, both in stables and on the top of mixens. Of course its action is for more mechanical than chemical. Well, this was mentioned in the JOURNAL some dozen years ago, and we see by the last issue of that very well edited paper, *Farming*, that other writers have come into our views :

" Dry earth containing a considerable quantity of humus is one of the best and cheapest manure preservatives. Every farm has plenty of this, the only cost being the placing it under cover. The greatest loss in a manure pile is the escape of volatile gases such as ammonia. These can be largely preserved by sprinkling the dry earth over the manure pile and about the stalls when the stable is being cleaned. Disagreeable odors will be prevented and fertility saved."—*Farming.*

Her Majesty's stock sale.—The usual annual sale of the Queen's stock took place at the Flemish Farm, in Windsor Great Park, on the 14th December last.

After luncheon, the following lots were put up to auction by the Messrs. Buckland & Sons : 43 Devons, Shorthorns, Herefords, and "blue-grey" beasts ; 550 Hampshire down, Southdown, and Suffolk sheep and lambs ; 90 bacon hogs and porkers.

The *blue-grey* beasts are, we fancy, the cross between the Shorthorn and the Galloway.

The following prices were realised :

Hereford steer of considerable weight fetched £40. A Shorthorn show bullock realised the same price, and a Shorthorn heifer £26. Devon bullocks fetched from £22 to £37 each ; Devon heifers, from £14 to £26 ; black Polled bullocks, £29 to £33 10s. ; blue-grey bullocks, £32 to £37 10s. ; prime Polled oxen, £24 to £29 ; Hampshire Down wether sheep, 62s. to 85s. ; Hampshire Down tegs, 55s. to 75s. ; Suffolk tegs, 55s. to 58s. ; South Down tegs, 43s. to 60s. Berkshire bacon pigs, from £8 to £10 15s. ; Berkshire fat hogs, £3 to £8 15s. ; Berkshire porkers, £2 15s. to £3 ; and white Windsor bacon hogs, £3 to £6. The total amount realised was £3,308, 11s.

Fall feeding of meadows.—No one, of course, who knows anything about the habit of growth of our valuable grass, timothy, would ever dream of turning his cattle on to it in the fall. But, where a pasture is composed of other grasses, and is not likely to become " poached " by the animal's feet, we cannot see any probability of its being injured by fall feeding. As we have remarked in this periodical a dozen times, look at the Sherbrooke street lawns, in this town of Montreal! Nothing can exceed their rich, luxuriant growth all the summer, and the more frequently the lawn-mower passes over them, the more verdant and profuse does the herbage become. It is no injury to sound pastures to feed them off in the autumn, except in the case of heavy, wet land. In the following extract, we find the New York farmer wrong, and the editor of *Farming* right.

" A New York farmer objects very strongly to the practice of pasturing meadows in the fall. He claims that there is more money lost by so doing than what is gained from the feed which the animals secure. It is doubtless injurious to turn stock on meadows when the ground is soft and wet, but the question is if very much harm is done when the ground is dry and firm in pasturing meadows in the fall. "

Average yields.—We find that in our last, we made a material error in the number of bushels of wheat to the acre in Scotland, in 1898. It should be 42.47, an enormous average, but it must be remembered that there were only 55,861 acres grown, no land being sown to wheat in Scotland unless soil, previous cultivation, condition as to manuring, and a favourable seed-time are all in its favour. There are sixteen times as many acres of oats as of wheat sown in the northern Kingdom.

The following *table* (work dreaded by the printers, so we will shorten it) shows the average yields of wheat, barley and oats for the ten years 1888-97.

PRODUCE OF WHEAT, BARLEY AND OATS.

Preliminary statement showing the estimated total produce and yield per acre of wheat, barley, and oats in Great Britain; the average of the ten years 1888-97.

Wheat.

	Estimated yield per acre.		Average of the ten years
	1898	1897	1888-97
	Bus.	Bus.	Bus.
England	34.76	28.97	29.19
Wales	26.83	24.76	23.49
Scotland	42.47	37.83	35.80
Great Britain	34.74	29.08	29.19

Barley.

England	35.44	32.48	32.93
Wales	32.82	29.86	29.22
Scotland	39.07	36.63	35.77
Great Britain	35.75	32.82	32.97

Oats.

England	43.49	40.26	40.50
Wales	36.37	32.56	32.42
Scotland	36.87	36.60	36.50
Great Britain	40.76	38.49	38.51

Potatoes.—Several very interesting experiments on manuring land for the potato have been tried at the agricultural school of the Cheshire (England) County Council. The best dressings appears to have been 15 tons of farmyard dung, 112 lbs. of sulphate of ammonia, 336 lbs. of superphosphate, and 112 lbs. of muriate of potash. The sulphate of ammonia was much more efficient than the nitrate of soda, as a nitrogenous manure; and the muriate of potash paid better that kainit or sulphate of potash.

As to the relative value of different varieties of the potato: Early Market Favourite came out the best among the early round sorts; as it did in the experiments of 1897. Of early Kidneys Challenge was the best, and of second earlies, British Queen. In late cropping tubers, Up-to-Date produced the enormous weight of 790 bushels of our standard, i. e., 60 lbs., or 846 of the English weight, 56 lbs.

In trials of cut vs. whole sets, there was hardly any perceptible difference; but large sets gave much better crops than small sets, and we have always held such to be the case, attributing the ridiculously small average yield of the potato crop in the States in great measure to the tiny sets employed; the weight of sets to the acre in England is usually about eleven or twelve hundred pounds, in the States half that weight is thought sufficient. Too wide planting is another cause of bad yields. Two feet between the rows and ten inches between the sets, is quite enough for the early, small haulmed sorts. The late, profuse-topped kinds naturally require wider intervals.

In addition to the above experiments, we must notice the always trustworthy trials of potato-manures at Rothamsted, from which, owing to the length of the time occupied by their continuance, some fruitful lessons may be learnt. They were begun in 1876, so that 1898 was the twenty-third year of their duration.

Their special object was to ascertain, not the value of different sorts of potatoes, but the manurial requirements of the plant.

The crop was grown continuously without manure, with various artificial manures, and also with farmyard manure, both alone and with some artificial manures. There were ten differently-manured plots, and under each of the ten conditions the crop more or less declined over the later compared with the earlier years. The average produce per acre of total tubers over the twenty years was —without manure, only 1 ton 11½ cwt.; with ammonium salts alone, 1 ton 18½ cwt.; with nitrate of soda alone, 2 tons 8 cwt.; with superphosphate alone, 3 tons 2¼ cwt.; with mixed mineral manure including potash 3 tons 6¾ cwt. Thus, purely nitrogenous manures yielded less than purely mineral manures, indicating that there was a deficiency of ash-constituents rather than of available nitrogen within the soil. With the mixed mineral manure and ammonium salts together, the average produce of total tubers was nearly six tons, and with the mixed mineral manure and nitrate of soda rather over six tons per acre. The better result by the nitrate of soda is doubtless due to its nitrogen being more immediately available, and more rapidly distributed within the soil, and so inducing a more extended development of feeding roots. The average produce by the mineral and nitrogenous manures together, over twenty years of continuous growth, was very nearly that of the estimated average produce of Great Britain under ordinary cultivation, and much more than that of Ireland.

Milking Shorthorns.—The breeders of pedigreed Shorthorns, eligible for admission to the Herd-book, are thoroughly awake to the necessity of improving the dairy qualities of the breed. There is only one reason for the lack of this quality in the Shorthorn, and that is the practice that obtained so long of drying off the cow as soon as it

was safe to do so after calving, in order to screw as many calves out of her as possible during her life. Besides, no doubt the fœtus was better nourished during the pregnancy of the dam, from her being in a position to devote the whole product of her food to its nourishment, instead of a large part of it being diverted to the formation of milk.

We really wish Mr. James Cochrane would send us some notes on his recent importation of "Milking Shorthorns," such as he promised us some eight or ten months ago.

The Council of the Shorthorn Society have adopted a scheme for the allocation of the £200 voted for the improvement of the dairy qualities of the breed. They practically take up the work of the Shorthorn Dairy-Fund Committee, and will offer prizes at a number of leading shows, generally for the best pure-bred Shorthorns exhibited gaining the largest number of points on both inspection and milking. We trust that these prizes may attract a large number of good milking cows to the shows, and thus demonstrate to dairymen the utility of the Shorthorn as a breed for combined dairy and beef purposes.

Butter colour.—In Denmark and Sweden, it is said by people who ought to know, that it takes 28½ lbs. of milk to make a pound of butter ; in Britany, 25½ lbs. ; in Holland, more than 30 lbs.! On very moderate pasturage, in Kent, England, our cows used to average a pound of butter from 2½ gallons of milk, about 25 lbs. They were all sorts and sizes, Sussex, half-bred Ayrshires, all more or less touched with the Shorthorn. The butter, when "off the grass," was a very pale straw-colour ; in winter, on meadow-hay alone, as nearly white as possible. Is not the majority of butter produced here artificially, though harmlessly, coloured? As it is not impossible that a law against even such innocent adulteration may before long be passed in England, we append an article from *The Feeding and Management of Jersey Cattle*, for the benefit of our readers :

"The factories in Denmark and Sweden are said to be excellently managed. The produce is all supposed to be pure, and the greatest care is taken to ensure that only first-rate and genuine butter is sent out. But Danish butter has to be 'prepared' to suit the various markets in this country. Manchester likes a pale butter ; Newcastle straw colour ; Leeds a deep, waxy colour. Why is this colouring resorted to? In order that the inferior white or pale butter may be passed off as the best. The colouring as regards butter may be considered harmless, since it is said the material employed is tasteless and innocuous, and that butter is only coloured to suit the taste or rather the eye of the consumer. But it is submitted that these are not the real reasons ; coloured butter is easy to sell, the uniformity which the grocer requires is obtained, and he is able to sell an adulterated article (for colouring *is* adulteration) at a better profit to himself than if he were to buy the best English produce."

Cheap grapes. — In England, hothouse grapes used, in our time to sell in Covent Garden market for from five shillings to seven and six pence a pound. Now, after the main part of the early season is over, we see they are quoted at the, to us, incredibly low rate of nine pence to two shillings. As usual, however, the middle-man gets the best of the bargain, for he nearly doubles the wholesale price to his customers, the retail price of grapes sold wholesale at 6d. to 1s. a pound, has been from 1s. to 1s. 9d.

Tomatoes too, are cheap enough in England. During the last months of the fall of 1898, they only fetched three to four pence a pound. Could not we manage to secure a share of this trade?

Lucerne, or Alfalfa as it is called in the States, is evidently being tried in many of the States of the Union, though, as yet, we do not hear much of its successful cultivation in our province. Still, those who have sown it on well prepared soil, with a dry subsoil, and had a little patience with it, speak favourably of the crop, though it does not seem to stand as long as it does in England.

A Massachusetts correspondent of *Hoard* says that he has a piece now productive that he sowed thirteen years ago. He recommends plenty of seed ; as much as 25 lbs. to the acre ; but our experience is that on land well prepared, 20 lbs. to the acre—17 lbs. to the *arpent*—is quite enough. It should be put in with the grain-crop in spring, and rolled after one passage of the chain-harrow, or the bush-harrow, if the former excellent implement is absent.

The correspondent mentions that he sowed the lucerne in a piece of land that had borne fodder-corn for six successive years. After the crop had grown to the height of 9 or 10 inches, he cut it

and let it lie on the ground as a mulch! What a quantity of food for cattle he must have had at his disposal to be able to afford to waste such good stuff!

Four months from seeding, he mowed the crop, 2½ feet high, and each subsequent year it yielded three good crops, the first measuring 4 feet in length.

Having sold his farm, the correspondent is still interested in the plant, and he relates that, on a visit to the old homestead, the present occupant told him that the lucerne piece was the most profitable field on the farm. "I have cut three good crops every year, and the only manure it has had is what you put on just before seeding, i.e. thirteen years ago."

Rations.—Very sensible observation in *Hoard* on the conditions that affect the problem of "What to feed, and Why."

In reply to a dairyman who wants a formula for cows weighing 750 pounds each, the editor remarks that

"Our friend has been specific as to weight, but that is only one of the conditions determining the amount of feed that can be profitably used. The temperament of the cows and the amount of dairy product they yield or can be made to yield are equally or possibly more important. It is self evident that it requires more feed to support a cow weighing 1,000 pounds than it does to support one weighing only 750 pounds; also it takes more feed in addition to the food of support for some cows to produce 20 pounds of milk than it does for others to produce 25 pounds or 30 pounds. This ability to make economical and profitable use of feed by converting it into milk is governed by the individual temperament of the animal and the length of time she has been giving milk. It thus happens sometimes that a small cow will both eat more and yield more than a large cow, and that a cow in full flow of milk can utilize more feed than where the flow has decreased fifty per cent or more.

"Moreover the market price of feed stuffs should always be considered in making a selection. It seldoms happens, especially in the older settled sections, that either oats or wheat are relatively as cheap as some of the other feeds, such as bran, the glutens, cotton seed meal and oil cake (at prices current a few years ago). The table published on page 789 is the best guide there is as to the relative feeding value of the several articles mentioned. Add the digestive protein to the digestible carbohydrates and 2.2 times the digestible fat and there results what may be called the sum of the nutritive units in the material. For wheat bran these figures would be 57.8 and for ground corn 84,1, which show that for purely nutritive purposes the latter is worth nearly 50 per cent more than the former, when so fed that it can be properly digested. And this accords with common experience.

"Why then do we so frequently recommend bran instead of corn when the market price of each is nearly the same? For one reason, because the residual manurial value of bran is much in excess of that of corn, and this matter of keeping up the fertility of the farm should receive attention. Another reason is that in making up a formula we often find that the other feeds used supply nearly all the needed carbohydrates and other extract, so that only protein is lacking, and this can usually be had at less cost by using bran. A ton of bran contains 252 pounds of digestible protein, whereas in a ton of corn there are only 158 lbs. For this latter reason, that is, because this needed protein can be obtained at much less cost in that way, we recommend the glutens, brewers' grain, buckwheat middlings, cotton seed and linseed oil meals in many cases. Protein is an essential element in milk making. So far as is now known there is no other source from which the casein in the milk can come. It is also the only source of supply for the organic part of the bones, muscles, internal organs, skin, hair, etc."

There is a good deal of sound practical sense in the above.—*Ed. of J. of A.*

The Dairy.

IMPORTANT TO DAIRYMEN

Two Recent Inventions Which May Revolutionize the Dairying Industry

It is well known that the dairy industry of Canada is capable of almost limitless expansion. In the matter of cheese-making Canada did not enter very early into the race for position, but to-day Ontario alone produces more cheese than the total cheese exported by all the States in the Union.

The manufacture of cheese and butter constitutes one of the most important industries of the province ; hence it is of great interest to a large number of people. Any device that promises to facilitate the manufacture of butter or cheese and augment the ability to compete in the world's food market will be considered with eagerness. Two such inventions are submitted for consideration.

Mr. D. M. Macpherson, ex-M. L. A., for Glengarry County, has made what promises to be a valuable contribution to the dairy industry. Mr. Macpherson is a large cheese and butter manufacturer, he has manufactured cheese for upwards of thirty years by the most progressive and up-to-date methods. He has often given indisputable proof of possessing accurate and complete knowledge of all the details, difficulties and needs of the enterprise. Mr. Macpherson has studied to meet the following requirements of the industry.

1. A more simple, compact and economic arrangement of cheese and butter making. 2 To provide a pump that will lend itself to ease of manipulation and perfect cleanliness. 3. To secure a process by which the butter fat now retained in the whey from cheese-making may be extracted and incorporated in the milk of the following day and made into cheese without extra cost. 4. To devise a combination factory outfit, that will permit the manufacturer to respond and take advantage of the fluctuations in the ruling prices of butter and cheese in the open market.

It is generally conceded that the combination factory, that is one fitted to make either cheese or butter, is destined to be the only factory fully serviceable. To equip a cheese factory for this requirement means, according to existing methods, disarrangement of existing plant, extra cost of machinery, building space, a larger boiler and engine, extra shafting, belting, piping, fuel, etc., and this involves an expense of great consideration. In order to secure this ideal outfit at less cost Mr. Macpherson utilizes a small, plain steam engine as motor, attached to and operating three pumps, one for elevating whole milk, another for elevating, skimmed milk, or skimmed whey, and the third pump is used for pumping either cold or hot water into the boiler, or water tank.

This engine has two drive pulleys, which drive the curd mill, churn and butter works. The entire apparatus, engine pumps, shafting, pulleys, etc., are portable; the engines and pumps are attached to one upright plank, with one end resting on the floor, while the other end is fastened to the upper ceiling. The proper and economic position of this apparatus and separator is at one end of the cheese or milk vat, and takes up only 20 inches of floor space across the width of the vat. The working of all the pumps, shafting. etc., can be carried on at the same time ; anyone or all parts can be conveniently worked together when necessary while butter cheese is being made. This does not interfere with the heating or stirring of the curd, because the heating is done by means of the exhaust from the engine and separator. This makes it possible to have the fresh whey immediately passed through the separator, and secures the whey cream in the best possible condition. The exhaust steam does all the heating of the curd and milk. This same cheese vat, without any displacement of apparatus or vat, can be used as a receiving vat when the cream is being separated and manufactured into butter.

It is well known to all dairymen that there is a large and unavoidable loss of butter fat incidental to cheese making. How to save it in a practical and profitable way has been an unsolved problem for some time. The amount of butter fat lost in making cheese is about three to five pounds of butter fat in every 1000 lbs. of milk. This loss of butter has the effect of reducing the richness, texture and quantity of the cheese produced from a given quantity of milk. This loss is said to be about five to ten per cent. of value per 100 lbs. of milk according to the good or bad condition of the milk at the time of making cheese. The aggregate loss in this way to the entire Dominion is upwards of $1,000,000 annually. These figures do not include loss from reduced richness or impaired texture. Mr. Macpherson claims to have solved the problem of how to collect and incorporate in the cheese the butter fat now lost in the whey. By actual experiment he extracted from the whey of 3000 lbs. of milk 82 lbs. of cream which is equal to 10 lbs. of butter fat, and on the following day incorporated the 82 lbs. of cream into 1000 lbs. of fresh milk, ready to be converted into cheese. The tests were satisfactory especially in showing a large increase of yield of cheese per 1000 lbs. of milk.

The estimated and attested benefits of these inventions may be briefly summarized as follows:

1. Cleanliness in the pumping operations is made possible, without encroaching upon other desirable features expected in a pump. The lack

of such a pump in the past has lost thousands of dollars to the milk producer.

2. They permit the manufacturer to instal suitable apparatus for butter making or cream separation in any ordinary cheese factory, with the least possible expense, in regard to machinery or building requirements, etc., even without displacing vats, boilers or steam piping.

3. They provide a convenient method of saving the butter fat now lost in the whey while making cheese, and afford a simple process by which this butter fat may be incorporated in the cheese without any additional fuel and with but slight labour.

4. They give a large increased value to milk owing to increased yield and quality of cheese, also from the ability to make either cheese or butter, whichever pays best, during all seasons of the year.

5. The small steam boiler required such as is used by the average cheese factory, a boiler about four or five horse power is sufficient to handle ten to twelve thousand pounds of milk daily for either cheese or butter making or cream skimming.

6. The saving in equipping a creamery or skimming station is from $50 to $400 in such items as machinery, building space, fuel, labour, etc.

It provides for the utilization of the exhaust steam, in heating milk, whey curds, water and building.—*The Star.*

BACTERIA IN CHEESE MAKING

(*Concluded.*)

Whether the normal ripening and the flavor of properly ripened cheese is due to a single species in each kind of cheese, or to the combined action of several, or whether it may not be produced by a number of different species equally well, as in the case of the butter flavor, is at present an undecided question. There is reason to believe that the flavour of different types of cheese is due to different species of bacteria, and that when we have mastered the problem we shall be able to produce any given type of cheese by simply inoculating the milk with the proper quantity of definite species of bacteria. But, I must confess, this belief is at present based upon general inferences, and not upon demonstrated facts. The fact that such definite types of abnormally ripened cheese can be produced by inoculating the milk with certain species of bacteria, shows the great influence of bacteria. The fact that a given locality will produce a uniform product of cheese for a long time, indicates that this locality has probably become impregnated with a certain species of micro-organism. Moreover, it is known that when a new cheese factory is started, precautions are frequently taken to carry some of the cheese from an old factory to the new one, and to rub over the shelves and vats and the other appurtenances in the factory with the old cheese, in order to infect it with the proper ripening organisms.

Many species of bacteria are known to produce desirable cheese flavours when growing in milk. In many cases the use of pure cultures has been adopted in cheese making, although scarcely from the bacteriological standpoint. One method of making Edam cheese consists in inoculating the milk with a slimy whey, which has been found to contain a very nearly pure culture of a slimy organism. These facts indicate that the cheese ripening is the result of distinct specific germs, but what they are, or how large a variety, is not at present known.

The sources of cheese bacteria are more variable than the sources of bacteria in ripening cream for butter. Of course, in the first place, there are many organisms in the milk which is brought to the cheese factory, but in addition to this the cheese is inoculated with organisms from several other sources. The cheese vats and the various apparatus used in the cheese factory are a prolific source of organisms. The water that is used in the manufacture of cheese is an important source. More important than any of these is the rennet which is used to curdle the casein. Recent studies of rennet have shown that the number of bacteria in it is very great, especially in certain forms of rennet. The rennet added to the milk in considerable quantities is thus a direct inoculation of the milk with a large number of bacteria. It has long been recognized that it makes considerable difference in the character of the cheese whether one or another kind of rennet is used for curdling, and after having recognized that the various types of ripening are due to different kinds of bacteria, it is at once seen that the addition of rennet to the milk is to be regarded as an inoculation of the cheese which will result in a vast modification of its ripening. This agency of the bacteria rennet in the ripening of cheese is now fully recognized,

but is, however, a subject upon which much work needs to be done.

We have, in short, at the present time an insufficient knowledge of the ripening of cheese to enable us to control the process. We can, to a certain extent, avoid some types of abnormal ripening by the following simple method: If cheese ripens abnormally it will probably be due to the milk from one or more patrons being impregnated with an unfavourable species of bacteria. By the use of a simple apparatus, samples of milk of each patron may be set by themselves and allowed to ferment spontaneously. After two days, an examination of the samples, a study of the odor, the taste, and the amount of gas produced, enables the cheese maker to judge somewhat accurately whether the milk is safe to put into his cheeses. If there is a superabundance of gas, or if very disagreeable odors are produced, the milk of the patron in question should be excluded from the cheeses.

Of course, it takes a day or two to apply this test, but this is a matter of no very great importance in the cheese factory, because the farm that is furnishing an improper species of bacteria one day will probably continue to do so for some time. A method of preventing the abnormal swelling of cheese has been suggested by Freudenreich, vig., the salting of the milk. When this trouble appears in a cheese factory, all the subsequent cheeses may be treated as follows: After the milk has curdled, about two-thirds of the whey is removed and salt is added to the rest to the extent of 3 per cent. The cheese is then made as usual, although a smaller quantity of salt must be put into it in the end. This use of salt has been found in some cases to be quite efficient in preventing the abnormal swelling. Another method of remedying the abnormal swelling, also based upon bacteriological knowledge, has sometimes been found to be useful. When the cheese begins to show signs of this abnormal production of gas it is at once cooled to a very low temperature, either by putting it into a cold cellar or, if the cheese is a large one, by the use of ice. This lowering of the temperature at once stops the fermentation which is going on, and if the cheese is kept at this temperature for some time, the milk sugar will gradually undergo such changes that when subsequently the temperature is increased the fermentation will not recommence. Beyond these facts, however, little of practical importance to the cheese maker has as yet resulted from bacteriological study.

In guiding the milk producer to the best method of furnishing pure milk, in aiding the butter maker in obtaining a uniform and desirable flavor, and in helping the cheese maker to avoid some of his difficulties, dairy bacteriology has already done much. In the immediate future I foresee further practical results. To the dairy interest the bacteriologist holds out the hope of uniformity. The time is not far distant when the butter maker may always make good butter and the cheese maker may be able in all cases to obtain exactly the kind of ripening that he desires.

H. Weston Parry.

Dec. 12th, 1898.

THE COMBINATION COW.

That a specially bred cow is likely to be most suited for special dairy work, no one that has given the question careful attention would care to dispute. That such a cow is getting a firmer foothold now than she had years ago is open to serious question. A Shorthorn calf of pure breeding is worth to-day in Manitoba twice as much as a purely bred dairy calf of the same age, and if the price is a fair criterion of value, from the purchaser's standpoint, the day of special purpose cattle is yet a good way off in this country. The call for pure Shorthorn males is getting more pronounced than ever, and along with that call comes the question, "Is he of milking strain?" One reason for this is that grade Shorthorn calves from any decent cow are found free growers and good doers. Such calves are always in request; the dealers cannot get too many of them. But, except as veals, the male calves, from common cows by a dairy bull, are not wanted, and the every-day judgment of the every-day farmer is pretty well supported by those who give more close attention to the question of grade breeding. The Shorthorn-grade leads everywhere as a beef steer. Amos Cruickshanks made it the business of his life as a breeder to produce a farmer's Shorthorn on which choice beef could be laid at the lowest possible cost, and was quite indifferent to milking qualities if he could only get the form he was after. But the old milking ancestry still keeps asserting itself and females will come strong in the tendency to make milk rather than beef out of the rations fed them. We breed with less careful methods

han the English, and therefore do not always find the milking tendency so strong as they do. The dairy cows of England are mostly of Shorthorn extraction, and even when it comes to a tug of war between them and the strictly dairy breeds they manage to pretty well hold their own. The London dairy show has had abundant examples of the power of the Shorthorn to hold its own, and frequently beat the picked cows from aristocratic owners of Jerseys and Guernseys. If we throw in the value of the Shorthorn grade calf, we find that the farmer who produces from his home bred Western cow a healthy calf by a good beef bull, is on the correct trail, and should be in no haste to leave it. Very few of us are of the stuff from which famous breeders can be manufacture, but the homeliest of us all can breed a a good paying grade.

What has been said about the influence of Shorthorns applies in a large measure to other beef breeds. Still, we must admit that they have not gained the name for milk-giving powers that the Shorthorns have done.—*N. West Farmer.*

Household Matters.

(CONDUCTED BY MRS. JENNER FUST).

After the holidays comes a reaction, as if one had lost something ; a void is felt, which nothing seems to fill up, but by a good plunge into the realities of life, we shall very soon lose ourselves in our daily duties, and mixed with these will come into our minds many pleasant little happenings which will bring forth smiles, and thus we shall soon find ourselves jogging along the old routine with a contented spirit.

There are sure to be a few young people who during the holidays have made the one great contract for life. A careful study of which, and how best to keep it when the time comes for its fulfilment, might well be made a study during the rest of the winter.

Well armed at every point for any emergency they need have nothing to fear, but look forward with pleasure to its finale.

What is it that makes, and gives to some girls such a charm over their neighbours? It is nice dainty ways which they have had the good sense to have taught themselves and still cultivate, a natural desire is ever with them to look, and to be, neat in everything they do. Such an one is never caught by unwelcome visitors ; so there is no reason for rushing away to make preparation for receiving them ; feeling, and knowing that she has no reason to do so, as she is neat and tidy as she invariably is.

It would be just as unnatural for her to be untidy, as it is for some to be tidy ; she never wears her hair so that it looks likely to tumble down at any moment, in fact, she is always neat and attractive in whatever way you look at her, and whatever she is doing.

Neatness costs nothing ; it is available to the rich and poor, many think than could they only gets nice rich clothing, the rest would be easy sailing : not at all : a nice well fitting cotton dress a clean white apron, collar and cuffs ; neat shoes or slippers : these things will carry her along for any call or demand on her time, and, will her natural gift of neatness in every thing she does, with always call forth admiration in all quarters, and is the answer to the question : what makes her more attractive than her neighbours?

BOILED ONIONS AS A SECOND VEGETABLE.

The firm white Spanish onion now in season, when boiled makes a delicious addition to our list of vegetables at this time of the year. The only thing to remember is this—they take twice as long to boil as do our onions. Peel and trim sufficient onions for your dish, drop them into boiling water, and let them cook until tender, then take them out with a skimmer and placed in a heated dish ; pour melted butter over them and sprinke with salt and pepper ; add parsley if liked. Heat half a pint of milk to the boiling pint. Rub together two tablespoonfuls of butter, one of flour, and one of cold milk, stirring until the mixture is like a thick cream : add this to the milk and keep stirring until the mixture is smooth and thick ; season with salt and pepper. When this sauce has boiled up once pour over the boiled onions and serve.

TO COOK A BULLOCK'S HEART.

There is an old-fashioned dish I know, but it is extremeley savoury and nice if properly cooked and eaten whilst hot. It makes an economical family dinner at a little expense. First soak the heart two or three hours in cold water to remove

the blood; then trim, take out all tendons, and wash clean. Make a stuffing of one cupful of breadcrumbs, one tablespoonful of melted butter, quarter of a tablespoonful powdered sage-leaves, and a pinch each of salt and black pepper. Mix these ingredients, fill the cavity in the heart, tie with a string, wrap in a piece of muslin, and put the heart into a pot, with boiling water to nearly cover. Let it simmer very slowly for two or three hours until it is tender, adding one tablespoonful of salt when about half done. Take the heart up, remove the cloth, and put it into a hot oven long enough to brown it, basting it well with clarified dripping. Serve with rich brown gravy and red currant jelly.

KEEPING FOOD HOT.

When it is necessary to keep a meal hot for a belated comer, do not set the place holding the food in a hot oven, thus discolouring the china as well as drying the food; instead, place the plate upon the fire over a pan of boiling water, covering the plate with a pan that will just fit over the edge of the plate. The food will keep hot, and there will be enough steam from the boiling water in the lower pan to keep the plate moist and pervent the contents becoming dried.

CLEAR AS YOU GO.

How many otherwise good housekeepers contrive to get into a muddle when baking morning comes round, or there is a little extra cooking in the shape of pastry or cake-making to be got through. You look round the kitchen, and there, filling up every available space, are cups, basins, spoons, and sundry other cooking utensils, so that when the tired woman has finished her cooking she has a most discouraging task in front of her, to get all these things washed up and into their proper places again. Now would it not be much better policy if everything were, as far as possible, washed and put away at once into its place, and the other things placed in a dishpan full of water as soon as their contents were used? How much trouble and hard work would thus be saved? Pots and pans should never be put back on the stove after being emptied, but filled at once with water into which a small piece of soda has been put. With a little care in these matters and a little thought given to getting everything in readiness before beginning the actual cooking, a kitchen may be kept orderly in the midst of a "field day" of cooking, for, as an old friend of mine used to remark, "forecast beats work."

PICKLED CABBAGE.

Get a large one, if the frost has touched it, the pickle will be all the more crisp for it.

Throw away the very outside leaves, cut the cabbage into quarters, then into thin shreds across the leaves.

The hard part of the stalks is generally cut away, but it is a matter of taste as some people like it.

Sprinkle plentifully with salt and let it remain 24 hours.

Drain from the liquor, and wash in cold water; if the water only just covers the cabbage it will, when drained away, show exactly the quantity of vinegar wanted.

To each quart allow one ounce of peppercorns a quarter ounce of mustard seed, a couple of bay leaves, and a quarter, ounce of whole allspice.

The spices to be boiled, in a muslin bag. with the vinegar, 15 minutes and then left to cool.

The shreaded cabbage must be made as dry as possible in a cloth, put into one large jar or several small ones, and the cold vinegar poured over it. In a fortnight it will be fit for use.

SULTANA CAKE.

This mixture makes a good family cake, such a one as will be suited to the children's needs where cut and come again is the motto, and where a rich cake is utterly out of place. Take a pound of fine flour, and mix with it a teaspoonful of baking powder, then pass through a sieve; this incorporates it thoroughly, and makes the flour light. Rub into the flour 6oz. of butter or clarified dripping, add a teacupful of fine white sugar—castor is the best—6oz. of sultanas cleaned, dried, and rubbed in flour. Whisk the eggs, mix with them a breakfastcup of milk, beat the mixture well, place in a buttered tin, and bake in a moderate oven from one and-a-half to two hours.

CRANBERRY SAUCE.

Cranberry sauce should be made the day before, so it will jelley nicely. To a quart of cranberries add eight heaping tablespoonfuls of granulated sugar and three tablespoonfuls of water; cook in a stewpan until all the berries have burst their skins and are almost like a jelley; then strain

through a sieve into a mould, and put away in a cool place till ready for use.

The secret of good cranberry sauce is the use of a very little water and quick cooking. Eight to ten minutes is enough, as otherwise the bitter taste of the seeds is developed. A small cup of water to a quaat of cranberries is sufficient. The sugar is added just as the sauce is taken from the stove.

ALMOND ICING.

The whites of three eggs beaten until so light that they are perfectly dry, one pound of finely pulverised icing sugar, one pound of almonds branched and beaten small in a mortar. Add the sugar a spoonful at a time to the egg, and put the almonds gradually in at the last, and then ornament a cake with it, using a broad knife dipped in cold water for laying on and smoothing the icing.

DO A LITTLE GOOD AT A TIME.

Dr. Johnson wisely said: "He who waits to do a great deal of good at once, will never do anything." Life is made up of little things. It is but ounce in age that occasion is offered for a great deed. True greatness consists in being great in little things. How are railways built? By one shovelful of dirt after another; one shovelful at a time. Thus drops make the ocean. Hence we should be willing to do a little good at a time and never wait to do a great deal of good at once. If we would do much good in the world we must be willing to do good in little things, little acts one after another; speaking a word here, doing a kindness there and setting a good example at all times. As F. W. Farrar, says, "Little self denials, little honesties, little passing words of sympathy, little nameless acts of kindness, little silent victories over favorite temptations—these are the silent threads of gold, which when woven together, gleam out so brightly in the pattern of life that God approves.

Swine.

PIG FEEDING AT NEWDALE.

While on a visit to Newdale, a representative of *The Farmer* had the pleasure of a turn through the buildings of G. W. Ray. He has been feeding pigs for years, and believes that the hog is as good a money-maker as there is to be found on the farm. He has now a large number of hogs ready for market, and a lot of nice ones they are. As the result of his experience and experiments, Mr. Ray has all his sows farrow during the months of August and September. Bran and shorts form the basis of the feed for both sows and young pigs. It is well cooked before it is fed. He is a great believer in bran as a food for pigs. The young pigs get bran and shorts until they are some four months old; then they get ground barley instead of the shorts. As soon as grass is ready the pigs go to pasture, still getting some bran and barley. This mixture is made up of about four parts of bran to one part of barley, by measure. About a month before he wants to market them the hogs are taken off the pasture and fed ground barley to firm up the flesh and put on the finish for market.

For green feed Mr. Ray has tried a number of feeds. Some years ago he sowed strips of corn, oats, peas, barley, wheat, rye, millet, and rape, side by side for pasture for the pigs. They preferred the peas of all the varieties of grain sown, but when once eaten off the peas did not grow again, hence they were out of the race. Wheat was the next choice of his pigs, and the rape they would not touch at all. Since then he sows about 10 acres of wheat as early as possible for pasture for his pigs, and finds that an acre of it will pasture 10 hogs during the summer. So far his pigs have had the run of the whole field. Next year it is Mr. Ray's intention to confine them on a portion of it at a time by means of portable fences, moving them as soon as they have eaten down the wheat.

The young pigs are given a good start by being left on the sow for fully nine weeks. Mr. Ray is a strong advocate of only two meals a day for hogs. He thinks a great many hogs are over-fed, and would do better if they had less food. He keeps a box with a mixture of salt, ashes and charcoal in, where the pigs can have access to it at all times. We would suggest that he add some sulphur also. By following this method of raising and feeding hogs, Mr. Ray claims to be able to turn off hogs at nearly a year old averaging well up to 300 lbs., that have not cost him more than one cent a day, or about 1½c. a pound. He finds that this way of handling his hogs leaves him more money than if he had them farrowed in the spring and fed hea-

vily to market them when they were six months old.

We must say it is a surprise to find that his pigs will not eat the rape. It may be that they prefer the wheat when given their choice, but that if compelled to they would eat the rape readily and do well on it. (1) We are also satisfied that an acre of rape will keep at least three times an many hogs as an acre of wheat will.

N. West Farmer.

SOFT BACON.

Notes from Professor Day on some Experiments at the Ontario Agricultural College, Guelph.

To the Editor of *Farming:*

SIR,—As Canadian packers have recently had a great deal of trouble with what is known as "soft bacon," perhaps a few notes on the subject may prove of interest to the many farmers who read your valuable paper. One of our leading packing houses makes the statement that, during the months of May, June, and a part of July of the present year, the number of soft sides ranged from 20 to 40 per cent of the whole. This means that Canada placed upon the English market this year a large quantity of inferior bacon; and though this bacon was not misrepresented, but was sold strictly upon its merits, at the same time it was Canadian bacon, and tended to bring discredit upon Canadian bacon as a whole. It requires no argument to convince any intelligent man that the condition of affairs just described means an ultimate loss to the farmer, because, when our packers meet with losses of this kind, their only remedy is to pay lower prices. It is therefore a matter of great importance, not only to the packer, but more especially to the farmer, that less soft bacon should be placed upon the market; and the problem of how to produce firm bacon should be carefully studied by every man who has a pig to sell.

Soft bacon does not mean fat bacon. It means a soft condition of the fat, which develops while the bacon is in the salt, and reduces the value of a side according to its degree. An absolutely soft side is comparatively worthless, and between this condition and firmness there are all shades and degrees of tenderness. Sometimes softness is noticeable before the bacon is put into the salt, but apparently firm sides frequently come out of the salt decidedly tender and soft.

Various speculations have been indulged in regarding the cause of softness. Corn, clover and lack of exercise are perhaps the chief things which have been blamed, but there is considerable diversity of opinion regarding the matter. For some months past, experiments have been in progress at the Ontario Agricultural College to ascertain, if possible, some of the causes of softness, and to study methods of producing firm bacon. In these experiments the hogs are shipped directly to the factory, slaughtered, and the different groups packed separately in salt. When the bacon comes out of the salt it is carefully examined by experts, so that there can be no mistake as to its firmness or softness. Our investigations are by no means complete, but some interesting results have been obtained. Full details of the experiments will be found in the College Report of 1898; but the following are some of the principal points brought out by the work up to date:

1. Though corn has been commonly blamed for producting soft bacon, it apparently has no evil effects when used for finishing hogs that have had plenty of exercise until they reach 100 pounds' live weight.

2. Neither does corn appear to cause softness when used for finishing hogs that have had no exercise, but have been fed skim-milk with a mixed grain ration until they reach 100 pounds' live weight.

3. What has been said of corn may also apply to rape, (1) when a two-thirds meal ration is fed with it.

4. Hogs confined in pens and fed wheat middlings during their early growth, and peas, barley and shorts during the finishing period (without either skim-milk or whey), have a marked tendency to softness of fat.

5. Hogs given plenty of exercise, and fed as just described, produce firmer bacon than those confined in pens and fed the same ration.

6. The evil effects arising from lack of exercise can be overcome by the judicious feeding of whey or skim-milk with the meal ration. From two to

(1) Of course they would. Will not they eat cabbages? ED.

(1) And yet, Mr. Day finds that hogs will not eat rape! ED.

three pounds of whey or skim-milk to a pound of meal will be satisfactory.

7. Whey and skim-milk appear to have a greater influence than exercise in producing firm bacon.

8. Unthrifty hogs are more likely to produce soft bacon than growthy, well-fed hogs.

The influence of whey and skim-milk in these experiments was especially marked, not only in making rapid and economical gains, but also in producing a fine quality of bacon, in spite of lack of exercise. While corn produced firm bacon when used for finishing well-grown hogs, it must not be assumed that it will not cause softness when used under other conditions. Its influence on younger animals has yet to be tested. In Danish experiments corn was found to be decidedly injurious to firmness when fed to very young animals.

It is to be hoped that feeders of hogs will carefully study this question of producing firm bacon, for it is a matter of vital importance if we are to retain our profitable English trade.

Yours, etc.,

G. E. DAY.

Ontario Agricultural College, Guelph, Dec. 14th, 1898.

CO-OPERATIVE PORK PACKING

A subscriber in western Ontario asks for information regarding the cost of erecting and operating a co-operative pork factory, and whether it would be advisable to erect one in his locality. It is very difficult to give definite estimates as to the cost of buildings, etc., and the amount of capital required to successfully operate one. To start on a scale that would allow for growth and expansion, would require at least from $25,000 to $50,000 for plant and equipment, and then it would be safe to have a working capital of several thousand dollars in addition. We know of one or two instances in the eastern provinces where a pork factory was started on a capital of $10,000 for building and equipment, but we think this is too small, and only admits of a very small business being done. We would advise all parties contemplating erecting pork packing factories, whether they are co-operative or not, to visit some of the establishments already in operation. Such a visit would enable them to understand the nature of the business and the magnitude of the undertaking.

As to the advisability of erecting co-operative pork factories there is some difference of opinion. One very important advantage which the co-operative packing establishment has over the large establishment in the big centres is that if properly managed it would be able to control to a large extent the kind of hogs produced by the farmer. A co-operative factory drawing its supply from a district within a comparatively few miles distant would be able to educate the farmers in that section as to the kind of hog to raise and how to feed it so as to make it produce the finest quality of Wiltshire bacon. This, the packer in the large centres who is separated a long distance from where he gets his supply can do only in a general way. But a co-operative factory with the stock held largely by farmers in the district would have a great advantage in being able to come directly in touch with every hog producer in the locality.

But it is well to consider the question from every point of view, whether a co-operative or any other kind of pork-packing establishment is contemplated, it is absolutely necessary that some skilled expert should be secured who thoroughly understands the selection and killing process, and the making and curing of bacon suited to the export trade. The erection of buildings and the management of the whole concern should be placed under the control of such an individual, who, as is the case with skilled labor, will have to be paid a good salary for his services. Where large capital is invested, such as would be required to operate a pork-packing establishment some person or persons of more than the average business ability should be connected with the concern to overlook its finances. There are no doubt farmers in every districts quite capable of looking after this part of the business if they would give their time to it. To finance well requires special training and careful attention, and unless that could be given care should be exercised in investing large capital. The buying and selling is also an important part of such a business, and unless the markets are closely followed, and the quality of the best, failure is likely to result.

As far as we are able to judge we do not think there would be much difficulty in disposing of the product in Great Britain so long as the quality was right, and the very best Wiltshire sides were exported. But then the supply must be regular, and when a customer is secured the factory must

be in a position to send forward a certain quantity every week or fortnight, as the case may be. And just here, for a time at least, will be one of the great difficulties in successfully carrying on a pork-packing establishment where the supply of hogs is to be drawn from a certain limited district. A factory that has a killing capacity of 1,000 hogs a week is not considered very large, and this would require a capital of about $50,000 for buildings and equipment. But we are very doubtful at the present time if there is one single county in Ontario in a position to supply every week (1,000 hogs) for a year. Double this number each week, however, is not beyond the capacity of every county if the farmers make a regular business of it; but this will take a year or two to bring about. Of course, in a district where a packing establishment were erected, the supply of hogs would quickly increase, and it would only be necessary to wait a year or two, if conditions were favorable, till a sufficient quantity of hogs could be secured.

Recent experiments conducted at Guelph, an account of which is given elsewhere, show that whey and skim-milk, combined with other feeds, make a good, firm quality of bacon. This being so, pork-packing and dairying should go hand in hand. Where both winter and summer dairying are made a specialty of, it should not be difficult, to get a sufficient supply of hogs in a comparatively small area to keep a good-sized packing establishment going. Ten or a dozen good cheese factories or creameries in close proximity, as is the case in Oxford or Perth counties, if running all the year around, making cheese during the summer and butter during the winter, or butter both winter and summer, could supply a good share of the food necessary to raise sufficient hogs to make a pork-packing establishment in the locality a success.

Co-operation, however, may be made useful to the farmer who raises hogs without investing money in a co-operative packing establishment. Co-operative selling of their supply of hogs would help farmers to get better value for their products. The plan would be for the farmers in a locality to co-operate and ship their hogs direct to the packer and do away with the middleman. If, say, twenty farmers would co-operate in this way, an ear-tag with the farmer's name or a number on could be provided and fastened to each lot of hogs. When the hogs arrived at the packer's each farmer could be paid what his hogs were worth. In this way the quality of the hog would count, as it does not where a middleman buys any and every kind at the same price. We would like to see this plan tried, as we believe it would be of great educational value and enable every farmer to get better value for his hogs than the present plan affords.—*Farming.*

The Farm.

LIEBIG'S WHEAT MANURES.

Those of us who read agricultural chemistry in the days of Liebig will remember his famous dictum that if the mineral food was supplied, the plant would obtain its nitrogen from the air. It was on this principle that he fabricated his wheat manure compounded of phosphates and other manurial substances. It proved a failure. It was reserved for our Rothamsted investigators to show the value of nitrates for wheat, and the utter powerlessness of phosphates alone to greatly affect the yield. Phosphates without nitrates were about equal to no manure at all. The fact is indelibly fixed in my mind without referring to the results published. We are now told that basic cinder is all that is needed, which is in flat contradiction to the results of agricultural chemical knowledge. What we do know is that all depends upon the land, for if a soil is exhausted of phosphates, a dressing of phosphates would tell even on wheat. Still on most fine, cultivated soils dressings of phosphates are not of much use to a wheat crop. It is nitrates which are required. We must accept facts laid before us, and it appears that there are soils upon which phosphates produced a marked effect upon wheat. So let it be, but the fact remains that on the great majority of soils a dressing of basic cinder or superphosphate on wheat would be entirely misapplied. Certainly we have been laying a faulty foundation of knowledge if we are now to learn that wheat benefits in a striking degree from dressings of phosphatic manures. Wheat does not need a great deal of phosphoric acid, and the length of time it occupies the ground and its abundant root system enables it generally to take all it wants from the soil. No doubt a mixture of nitrogenous and phosphate manure is the best application for wheat, but take away the nitrogenous element and the phosphatic treatment would in most cases produce an effect which might

in many cases be written down as *nil*. Not so nitrates, for they are essential to an abundant crop of wheat, and an application of nitrate of soda would in most cases enable the growing crop to take up whatever additional phosphates it required from the soil.

There appears to be no progress in agricultural knowledge, for after certain principles have been established, some one is sure to arise with new ideas utterly opposed to what has been previously ascertained to be true. Those who know the least, assert the most positively, but those who know most are aware that no absolute conclusion can ever be arrived at, and that in agriculture more than in any other pursuit, circumstances alter cases.

JOHN WRIGHTSON.

PLOUGHING MATCHES.

Again, this fall, we have been present at a good many ploughing matches.

Ploughing is a most important operation, and cannot receive too much attention; indeed, it is impossible to give too great encouragement to these matches, and, to that end, more method should, if possible, be put into their management.

1. The depth of the furrow should be suited to the soil. Some plough too deep, others too shallow, on the same soil; so the programme should state the dimension of the furrow-slice required.

2. The ridges, at the matches, as well as elsewhere, should be of the same width all over the piece: we have seen them 8, 10, 12, and 14 feet wide in the same field!

3. One man lays the slice over flat, while his neighbour kicks or pokes over his furrow to prevent its falling back into the same place it was taken from.

4. While the furrows are generally drawn pretty straight, they are not packed close enough. Hence the grass and stubble show through the intervals.

5. The crown-furrows are often ploughed too deeply, so that the bottom of the furrow in the middle of the ridge is lower than the bottom of the furrow between the ridges.

6. The ridges are too much rounded, which makes them drain with more difficulty, although most people think the contrary. Of course, the ridge ought not to be hollow, but a very slight rounding is enough.

It is not the top or surface of the ridge which requires draining, but the bottom of the furrows.

It often happens that, in badly ploughed ridges, no water is perceptible in the open furrows, the water-furrows, or even in the ditches, and yet the land is too damp for sowing. Why is this? Because the water is hanging under the ploughed surface instead of escaping at once.

How should we define good ploughing? To plough well, in our climate, is too succeed in *draining* and therefore *warming* the soil by means of the plough.

The colder the soil, the deeper should we try to move it. *Try*, we say, because it cannot be always done at the first attempt. We know that everything goes well when the seeding is done early. Three things are needed to secure a good growth:

Air, *moisture*, and *warmth*. Plenty of moisture we always have, in spring especially; but badly drained land often remains cold even as late as July; and here, drainage by means of the plough must effect a cure.

It is all very well to make water-furrows and ditches, but the first step is good ploughing. (*Abridged from the French*).

G. VU.

P.S.—We are sorry to say that, too frequently, the judges are but bad hands at ploughing; this would not signify so much if they knew what good ploughing was: but they do not! To remedy this, a first-rate ploughman ought to plough a ridge, the day before the match, and to show it to the judges (1).

Lastly, badly constructed ploughs are the cause of a great deal of bad work.

GOOD AND DURABLE PASTURES.

(*COL JAMES WOOD NEW YORK).

* Address given at Hartford, Ct, Dec. 14, with discussion, and reported especially for this paper.

What shall we do with our rough, rocky, hillsides? Our ancestors raised corn, rye and buckwheat, and the land was cropped, and washed by the rains, until there is often nothing left but the skeleton. Competition of the west has made it

(1) In our opinion, the judges should be constantly in the field, while the match is going on, to see how the furrows are laid, and to inspect the sole of the furrow, to see if it is flat, as it should be.—ED.

difficult to cultivate the hillsides with profit. Grass is about the only staple farm crop which pays in the east. In a mowing field we must have those varieties together which reach their maturity at about the same time, but on a pasture we want varieties that make growth and reach maturity at different times, supplying food at all seasons.

To fit these hillsides for grass pasture, we must get them in cropping condition. Some of them can profitably be cleared and plowed. The old system of summer fallow is good. The inorganic matter of the soil is thus made available by nature's forces. Economy is necessary; we must not spend more than the land will be worth. The greatest implement for summer following is the spring tooth harrow, which can be run over the land frequently during the summer. In September, add a dressing of manure and sow the grasses. Do not try to grow grain too. The grain costs more than it's worth in the injury of the grass.

I took ten acres of rough land and tested a large number of kinds to find those that would pay me. Those that flourished under the conditions of soil and climate, I called my friends. Those that could not stand it, I had no use for. The grass must not only grow, but it must be worth something. An old wether can find out the feeding qualities better than a chemist. Grasses that a sheep will eat are better than those they will leave.

September is a favorable time to sow, because weeds will give less trouble than in spring.

If the soil is cultivable, better spend two years in preparing for a permanent pasture. Thoroughly prepare the land and sow crimson clover (1) in summer, if it does well in your section. Get seed grown nearby, if possible. This clover will furnish the cheapest possible nitrogen. Until recently we were dependent upon European authority in regard to pasture grasses, and the tests were not always reliable for our conditions. Few stations have carried on grass experiments.

As a result of my own experiments, I placed orchard grass first, as the most valuable pasture grass in the world. Many who have tried this plant found it worthless because grown under wrong conditions and generally cut too late, but as a pasture grass it has no equal according to my experience. It is a deep rooted plant; shallow rooted plants must have moisture near the surface and will not stand a drouth so well. The roots of orchard grass go down where the water is. Second in value is crested dog's tail. This is used largely in England for parks because of its brillant color. It is the only variety which remained clear and unmixed with other grasses or weeds after fifteen years in sod. Its durability is wonderful. Sheep like it. It forms a close mat of vegetable matter on the soil and for this reason proves well adapted to golf links. The seed is in great demand at present for that purpose, causing an unusually high price. Doubtless the price of the seed will go down in a few years. Next I value meadow fox tail, which helps to carry out the season, and a combination of the varieties mentioned gives a supply of feed from early spring until winter. Never put on too much stock. Leave a little of the growth on the field in the fall and you will have feed two or three weeks earlier in the spring.

Mr. Noyes: How much seed do you sow? Col Wood: I was afraid some one would ask that question, but I can hardly lay down a certain rule. The general rule is to sow very liberally. Some kinds of seeds can be bought only in chaff. All seeds in chaff I sow 3 to 4 bu to the acre, sowing orchard grass in mixtures I use 1½ bu per acre, and of crested dog's tail 10 lbs. Question: Orchard grass you say is more durable than timothy, yet the timothy lasted 18 years? Col Wood: I have known orchard grass which has been planted 50 years and it is as thick as hair. A piece well seeded with orchard grass or a pasture well seeded with the varieties which I have mentioned for that purpose will never need to be reseeded. It is done for a lifetime, and I think your children will not have to touch it either.

Mr. Seelye: You say that bushes and briers should not be allowed to grow, but when the land has been neglected and they have gained a foothold, we are confronted by a condition, not a theory. Col Wood: You must cut them once, then after they start again browse them with sheep. Wire fencing will keep the sheep in and dogs out. Grain them and they will clean the land.

Some of the questions at this point showing a misunderstanding about the variety which the lecturer called meadow fox tail, Prof. Jenkins explained that there is another wild native variety called a summer fox tail which is nearly worthless and by no means the same as meadow fox tail, which is the grass which the lecturer advocates.

(1) White mustard here, as crimson clover is too delicate for our climate. Not much gain in nitrogen, though.—Ed.

WINTER MANURING OFTEN GOOD PRACTICE.

A. A. SOUTHWICK, MASSACHUSETTS.

I read with much interest in a recent issue the well-written and scientific article on applying manure to frozen ground. Many of us who have large amounts of stable manure to move to the field could not very well agree with Mr. Read that there is great loss and waste in spreading on the frozen surface of almost any of our reasonably level cultivated fields. Is it not true that where the ground is frozen that manure on the surface is also made intact and to a reasonable degree safe from loss from washing or evaporation by frost? Many of us would not be able to farm to any great extent if we waited until nearly planting time before moving the stable deposits. I have watched these things in the field, and I have never been able to discover the location where manure has been washed by natural surface water.

I hope we are all of us sufficiently familiar with the ins and outs of farming to know that manure upon the surface of side hills or in proximity to water courses or standing water may suffer serious loss from water action, but such conditions, in my opinion, should not influence us in our general farm operations. I believe I am able to say with all honesty that our crops grown largely upon land dressed during the winter with a good coat of stable manure (1) are better and more satisfactory than in the old days when the ideas were iron clad and must be carried out to the letter.

In the management of our soils we should do more solid thinking, looking to future operations. Some of our crops develop an immense growth, largely from the atmosphere. This remains upon the ground after the crop is harvested. Such is the case with all the vines, such as tomatoes, potatoes, etc. Instead of spending valuable time and money in taking this off, add to the always welcome supply of humus by plowing it under, and along with it, if possible, a good coating of manure, thus returning to the soil not only what has been extracted from the soil by the growing crop, but in addition that which has been developed from the atmosphere. Nearly all of our agricultural soils have sufficient absorptive properties to care for whatever may be applied in the way of fertilizing material, and I think we may feel reasonably safe in applying such at any time of the year.—*N. Eng. Homestead.*

(1) Possibly; if spread at once. ED.

The Poultry-Yard.

Fattening of Chickens in England.—The forcing or Cramming Process.—How it is done.—The kind of food used.—Large chickens in demand. A new channel for enterprise.

The fattening of chickens by the "forced" or "cramming" process has long been in vogue in England and France. It will, perhaps, be of import and interest to the numerous readers of the JOURNAL OF AGRICULTURE to know something of the methods employed and the foods used. The raising and fattening of the chickens are two distinct occupations in England. The farmers raise the chickens to the age of 3 or 4 months, when they are bought by the "higglers" or fattener. The cost to the farmer to raise a chick to saleable age is put at six pence (twelve and a half cents) and he receives for it one shilling and eight pence (about forty cents) to three shillings and six pence (about eighty-five cents), according to size and condition. It is an object then to the English farmer *to raise large chickens.* And he does so, we are told, by cooping up the mother hens and their broods, and carefully feeding and caring for the latter from the first. While the mother hens are so cooped, the chicks, of course, can run in and out of the coops at their pleasure. This plan of caring for the chicks has frequently been urged in the columns of this paper. In previous articles, I have stated that a chicken which has become "stunted" during the first five weeks of its life from being "stinted" of food, will never make a satisfactory market fowl. The practice in England proves the correctness of my statement. The best cared for, make the biggest chickens and the biggest chicken receive the highest price. The moral is obvious. Care for your chicks. The English farmers have found that chickens of the Dorkings; Indian Game and Dorking Crosses, both ways; Orpingtons; Plymouth Rocks and Wyandottes, all make vigorous growth and rapid flesh development.

The demand for Chickens.

Few English farmers fatten their chicks. As already said that is the work of the "higgler," or, fattener who has special arrangements for so doing. It is gratifying to know that such is the demand

for the chickens that they are eagerly bought up by the "higglers," who do not always get the number they require. In order to facilitate the collecting of the chickens, the higglers with horse and cart and large crates, go over different "routes," at regular periods. While the farmers make a handsome margin of profit, there must be money in it for the "higglers" who, we are told, are "so numerous as to almost trip over each others heels." When the supply of English chickens give out, the Irish birds are looked for. The Heathfield (Sussex) district in England is noted for the excellence of its poultry. Speaking of the profits in poultry raising, the Vicar of Heathfield says "that raising chickens for the fattener is the means whereby many a farm laborer is enabled to marry and live comfortably. Without his poultry he would not be able to do so." The remark is worth the consideration of many farmers (in Canada) who allow their boys to go away from their farms.

The Fattening Coops.

Having secured his chickens, or as many as he can, the higgler takes them to his fattening sheds and coops them. The fattening sheds are of different kinds. Sometimes an old stable, or barn, is utilised. The coops are arranged in rows, with three feet passage way between them. The bottoms of the coops are slatted, so as to permit of the droppings falling through. Cobb, an English authority says: "A shed 13 feet wide and 40 feet long will comfortably accommodate 18 coops, which will hold 360 birds." The average coop is two feet in width and will contain four birds. The fronts of the coops are narrow slabs of wood, or small round iron bars, one eighth of an inch thick. The feeding troughs are V shaped and are placed in front of the coops. In many establishments, blinds of cloth or wood are arranged in front of the coops, and are partly or wholly drawn down, or closed, during the third week, so as to keep the birds in semi, or total, darkness, except at feeding time. Some fattening establishments are on a large scale.

The Forcing or Cramming Process.

On the chickens being put in the coops, they are allowed to fast for twelve hours, sometimes longer. By this time they are accustomed to their surroundings and are hungry. For the first eleven days they are allowed as much food as they can eat, when the forcing machine or crammer is brought into requisition and the food is forced down the throats of the birds. The food is given in a semi-fluid condition, twice or thrice per diem, and only in quantity sufficient fill to the crop. The machine is worked by foot or hand. At the end of three weeks, the birds ought to be fattened and they are killed. Sometimes a week longer is required to properly "finish" them.

The kind of foods used.

In England, the popular fattening food is made of finely ground oats mixed with milk, and during the second and third weeks with tallow, or mutton fat. Barley meal is sometimes used in proportion of one part to two of oatmeal. In France, buckwheat meal is sometimes preferred to barley meal, which is said to be too heating. Cornmeal is objected to in England, as it is apt to give the flesh a yellow tinge. The cost of fattening a chicken in England is put at twelve to fifteen cents and the birds sell from three shillings and six-pence to seven and six-pence each. But my letter is long enough for the present. Let some enterprising farmers fatten up their chicken for the Montreal market.

A. G. GILBERT.

HOW Mr. WYCKOFF FEEDS.

Fanny Field's way.—She says: I keep my hens scratching about all the time from daylight until dark.

After they are in their roosting-rooms at night, I go out and scatter about one quart of oats over the litter on the barn floor, and as soon as it is light, the hens are there, scratching for dear life, until I take out the breakfast of warm mash. You see there is a roosting room each side of the droveway, and I leave the doors open at night, so the hens can get out as early as they like. Of course, a quart of oats is not much for one hundred hens, but it is enough to keep them busy for an hour or two, and give them an excellent appetite for breakfast. The breakfast is a mash of bran, meal, meat scraps, table scraps, cooked vegetables, mixed stiff and fed warm. Regularly four times each week, they get four good tablespoonfuls of Sheridan's Condition Powder in the mash. The usual proportions of the mash are two quarts of cornmeal, two quarts of meat scraps and the rest table scraps and bran, the whole when mixed ready for feeding, filling two common wooden

pails about three-quarters full. That does not seem much of a breakfast for one hundred and four fowls (there are four roosters in the flock), but it is all they get and when they have swallowed the last bit, they fall to scratching the litter in the droveway. About eleven o'clock, they get green food, generally apples whole, and then, about one, they get another quart of grain, generally a mixture of wheat, oats, and cracked corn, scattered through the litter. This amuses them until supper-time, which comes as late as the fowls can see to eat. The supper is grain, usually a mixture of two quarts of good wheat, two quarts of cracked corn and one of oats. During the coldest weather, an extra quart of corn is added, and sometimes (not oftener than once a week) barley is substituted for the oats usually given during the day. Up to the middle of January, she had sunflowers seeds, and twice a week she fed two quarts at night instead of corn. Up to February 1st, the green food given was apples, raw cabbage, rowan, i.e., second-crop clover; when the supply of apples gave out and the supply of rowan too, she buys cut clover to fill the bill for green food, and finds that it pays to do so, as cut clover is a great factor in egg production in winter. The sale of cut clover by the bag has become a great industry; it is used extensively in the United States. (1)

POULTRY.

Weights at the table poultry show.

The following are the weights of some of the leading specimens. These are for couples, as the birds were not weighed separately, and it is interesting to note that the highest fowls in the show were the second-prize Langshan cockerels, scaling at 21½ lb The second to these were the Indian Game and Dorking first-prize cockerels, the latter, of course, being finer in bone than the former:

	lb.	oz
First prize, Dorking cockerels	16	12
First prize, Dorking pullets	15	6
First prize, Old English Game cockerels	10	14
First prize, Indian Game cockerels	17	0
First prize, Langshan cockerels	19	2
Second prize, Langshan cockerels	21	8
First prize, Orpington cockerels	14	8
Third prize, Orpington cockerels	18	2
First prize, Plymouth Rock pullets	14	12
Third prize, Plymouth Rock cockerels	17	4
First prize, Wyandotte pullets	14	2
Third prize, Wyandotte cockerels	16	0
First prize, Lincoln Buff cockerels	15	6
Second prize, Faverolle cockerels	13	2
First prize, Old English Game-Dorking cockerels	15	0
First prize, Indian Game-Dorking cockerels	29	12
First prize, Indian Game-Dorking pullets	13	13
First prize, Indian Game-Sussex cockerels	16	14
First prize, Dorking Langshan pull ts	15	8
Second prize, Surrey Dorking pullets	12	10
First prize, Surrey or Sussex cockerels	20	4
First prize, Surrey or Sussex pullets	14	6
First prize, Aylesbury ducks	17	14
First prize, Rouen drakes	14	4
First prize, Aylesbury Pekin drakes	15	8
First prize, Toulouse geese	40	0
First prize, Embden Toulouse ganders	39	4
First prize, American Mammoth bronze turkeys	52	0
First prize, Bronze turkey hens	28	8
Second prize, Bronze turkey hens	30	8
First prize, Belgian rabbits	11	12
Second prize, Belgian crossed Silver rabbits	11	0
Single lop rabbit	9	0

The attendance at the Show on the first day was slightly under that of last year, namely, 1,365; on the second day there were 2,491, which is fifteen short of the corresponding day last year; on the third day there were about twenty more than last year, so that the attendance was very well maintained.

(1) Omitted in the last number. ED.

The Flock

THE ECONOMY OF SHEEP BREEDING.

The improvement in cattle, horses, and pigs which has been so great during the past century, has had an important bearing on the success of British agriculture. It has been the envy of every country in the world, and the world has taken advantage of the development which has been effected. British agriculture has needed all the help that the improvement in these animals has given, and needs it more than ever now; but if one were asked what had signified and helped in its developement more than any other thing, one must unhesitatingly say sheep. All along the line, since a century and half ago when English farming awoke from the slumber into which it had lain for centuries, agricultural advancement had gone hand in hand with sheep improvement. Moreever, it could not have taken place without it. In fact, sheep have made the farming of England. All honour to those who have led the way; it has been the work of the farmer, and not the capitalist who has been able to take up the breeding of high-class animals regardless of the

cost. If one could imagine the country farmed without the turnip or clover crop it would be easy to realise that the keeping of sheep in arable land must be of a meagre nature; and that if an attempt were made to keep sheep on the high quality found in all districts, how little success would be achieved. These two crops gave the opportunity of carrying a greater number of sheep in both winter and summer, and providing food which is suitable for their improvement in condition at all seasons. But the sheep, as they existed, were so slow in coming to maturity that even with this great addition to their food, they would not have given a return that would have met the expenses of the root crop. The improvements in British agriculture and of sheep, have therefore been affected side by side, and have been in sympathy throughout ; so that to-day in spite of depressing prices, they both stand on a higher level than at any other time in their history.

It is true that other countries from special circumstances, have, with an inferior agriculture, been able to compete successfully with the English farmer, but they have bought his live stock. The grazing countries have largely availed themselves of his sheep, but the corn-growing countries have not done much in this connection. When the first virgin fertility is taken out of the land and manuring becomes necessary, a more complete system of farming has to be adopted or the land left to itself. The country that cannot support sheep in winter must be unfavourably situated. The countries that can carry sheep at all seasons must adopt a system which follows somewhat on English lines, and that implies expenses on very similar terms. In this will be one of the saving features of English farming in the future.

Benefits of sheep keeping.

It is not difficult to see in what ways English farming, more espetially in some districts, has benefited by the golden hoof of the sheep. It is of course, more particularly on the lighter soils that the greatest good has been effected. The best recognised instances of the good effected by sheep are seen on the Downs, and on thin, sand land such as is found in parts of Norfolk. These soils could not be cultivated profitably without the aid of sheep ; the consolidation of the soil, in addition to the manuring, render corn growing possible, where in former times but little corn could be grown. In a less pronounced degree the light and medium loam are kept in profitable cultivation by the winter keeping of the sheep. Very heavy land does not suit sheep so well as the lighter soils ; and the land itself is not so much benefited because the treading, so favourable to the lightest soils, is often prejudicial. At the same time heavy land is capable of carrying more sheep than it is usually called upon to do. But in this case the cropping would have to be specially adapted. The great attack of liver fluke which caused such devastation among sheep in 1879-1882 was particularly severe on the heavy land, the wet seasons keeping it in an oversaturated condition, and consequently favourable to the development of the fluke. In many of these the head of sheep has never been brought up to the number existing before the attack. Much of this land has gone into what is called permanent pasture, although it is only so nominnally, for there is little in it that ressembles a good permanent pasture, and in sheep carrying powers are very small. The land is thus to a great extent lost to sheep raising. Had a system of cropping been adopted which would have been favourable for sheep keeping much of it need not have gone out of cultivation. Previously to the wet years mentioned, much of this land had prospered as what is known as wheat and bean land ; and when corn growing became unprofitable few of those farming it saw their way to making such a change in their systems of managemrnt as would permit of its being kept under cropping. Thus, it fell out of cultivation or was sown with seeds for permanent pasturage, as has been seen with little advantage in most cases ; although the small return may be bettter than the loss which would have occurred if wheat growing under such a rotation as the four-course had be persisted in.

W. J. M.

BEES.

I would be glad if you would kindly answer the following questions, viz., (1), What are the sexes of the bees found in a bee-hives? How long does each kind live, and what is the special work they do ? (2), What is the honey flow ? (3), How do bee-keepers regulate the numbers of workers and drones and through that stages does a bee pass from the egg to the perfect insect ?—T. N. C.

[(1). Bees are of two sexes, male and female.

The queens are females and the drones are the males. There is only one queen in the hive, and there is, or should be, a very limited number of drones. The hulk therefore, of the bees of a hive, it will be inferred, are neither male or female. This, strange though it may appear, is exactly the case. The third kind, known as workers, because they do the various kinds of work in a bee-hive, would be properly named neuters in the sense that they perform the function of neither male or female. The best description of these bees is immature females. Taking these bees in the above order, we shall find by careful observation that the *queen* is the egg-layer, and is now often called by the more appropriate name—mother-bee. She performs her work of egg-laying during the spring, summer, and partly through the autumn, under natural or artificial conditions. By this I mean that there are time when the queen ceases to lay even while the weather is not winterly. During such a period the queen may be kept at work by giving the bees food in one of the forms in which sugar is given as a bee-food. Though the queen may live four or five years—and it is claimed by some bee-keepers that they will live even longer—they are of very little use after their second year if during that time they have been kept well at work. The length of life of a queen should therefore not be prolonged beyond her second year.

The drones have a very precarious existence, depending chiefly upon the supply of food. Their usefulness is during the summer, but only if young queens are reared. As soon as swarming is over and the hives all contain fertiles queens, the bees only wait for the income of honey to lessen, then they very expeditiously turn out the drones to die. Their life at the most extends only to a few months.

The little bees deprived of every function connected with the propagation of the species are most valuable to the bee-keeper, as they, and they alone, gather nectar from the flowers, make vax, build the combs, and do the other work of the hive. Being such busy workers their life is a short one, but it varies according to the work they perform. During the summer they live only a few weeks, because their works is then unceasing, while if they come into existence when the work of the season is over they may live through the winter. The average length of life of a worker bee is given as 46 days. The work of these bees varies ; for about a fortnight their first duty is to digest food composed of honey and pollen and give it to the queen when she requires it, and to the thousands of grubs that are on the cells. Then they turn to the work that quickly ends their existence. They make the cells and fill them with honey, and this work they continue to perform until they die.

(2). The honey-flow is a most appropriate term applied to that part of the season when honey appears by the weight of the hive to be almost flowing into the cells. While a good flow is on a strong lot of bees will gather several pounds of honey daily. Naturally the honey-flow coincides with the time when the fields contain most flowers.

(3). Above I have stated that workers *only* gather honey, consequently we requires workers in abundance and not drones. In badly managed hives there are drones almost sufficient to consume what the workers gather. This catastrophe is prevented and full honey-boxes secured by ensuring combs composed of worker cells. If left to built their combs unaided, the bees are almost certain to build a large proportion of drone cells, which means hundreds or thousands of drones the following season. By placfng in the centre of each new frame as given to the bees a sheet of wax pressed with the shape of worker cells, combs of worker cells are produced, and workers instead of the uncessary drones the next season.

Bees pass through the various stages from the egg to the perfect bess as follows : the queen in 16 days, the drone in 25 days, and the worker in 21 days. All are produced from eggs. Each egg lies in the cell for three days, and then a grub appears, this grub is liberally fed until it fills the cell. It it then imprisoned by a capping being placed over the mouth of the cell. While hidden from view it undergoes the wonderful transformation that must take place before a perfect bee can eat its way out of the cell].

EXPERT.

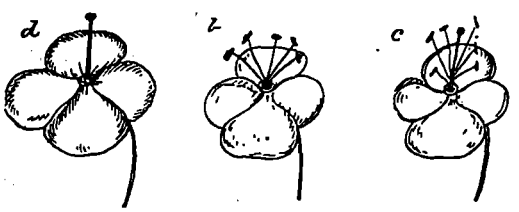
The Orchard and Garden.

(Conducted by Mr. Geo. Moore).

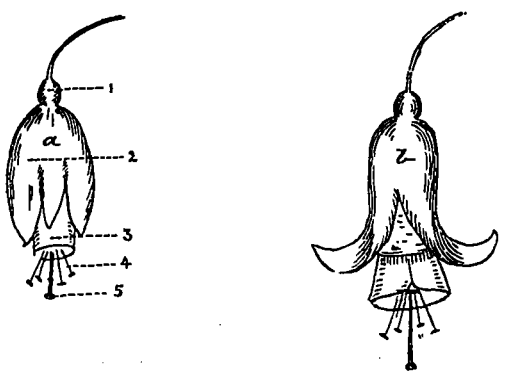
HYBRIDIZING AND SELECTION.

There is no more fascinating operation connected with horticulture than that of systematic hybridization and selection for the purpose of obtaining new and improved varieties of fruits and flowers. A description of how this is accomplished and the results achieved may be of interest.

It will be necessary to explain to the uninitiated in botany, some facts to render this article intelligible.



d. Imperfect pistillate flower.
b. Staminate.
c. A perfect flower.



a. Incurved sepals.

1. Pericarp or seed sack.
2. Calyx and sepals.
3. Corolla.
4. Stamens and anthers.
5. Stygma or style and pistil.

b. Reflexed sepals.

All plants have male and female organs of reproduction in their blossoms. These are called pistils and stamens ; at the tips of the pistils is found a little gummy matter and in those of the stamens are little sacks called anthers. These contains a very fine powder called pollen, and it is absolutely necessary that some of this pollen must come in contact with the pistil before any seed can be produced. This union is effected naturally by insects which lodge upon the flowers or by the action of the breezes which shake some of the pollen on to the pistil at the time when it is in the right condition to receive it and thus the process of fecundation is accomplished.

Most plants have pistils and stamens in the same flower but there are some which have the pistils only and these are called pistillate, while there are others which have only stamens and these are called staminate. Some varieties of the garden-strawberry are examples of this; people who dot understand sometimes wonder why their strawberry bed has yielded no fruit, when the cause is that they have planted a staminate, or pistillate variety only, and these being none of the opposite set in the locality, the blossoms have not been impregnated with pollen, and entire sterility is the consequence.

The effect, as before stated, is produced by the provisions of nature but it may be done artificially and systematically, and produce varieties almost at the will of the operator.

To do this it will be necessary to protect the flower so that no pollen except that which is desired can come to it. This is usually done by tying a piece of gauze over it, watching carefully to see when the pistil is exuding the gummy matter at its tip, and then placing the pollen of the variety with which you wish to cross it, upon it with a fine camel's hair pencil, you will soon see whether the operation has been successful by the darkened appearance of the pistil, and then the covering of gauze may be taken off.

The process and the end gained is full of interest, and it is astonishing what results may be achieved, and how one variety will show its effect upon another in producing a seedling which partakes of the characteristics of both parents.

Some flowers are much easier to hybridize than others because the stamens and pistils are more prominent, the Fuchsia for instance. (1) A good many years ago a person undertook to produce a Fuchsia which would be an improvement on existing varieties. The varieties of that time, with very few exceptions, had incurved sepals only, so that the corolla, the most beautiful part of the blossom was hidden. Now, to obtain a variety with reflexed sepals would of course be a desideratum (the accompanying sketches will

(1) Name derived from Fuchs, a German botanist ; almost invariably spelt wrong, fuchs-fox. Ed.

explain) ; and to effect his object, the operator took the pollen from the only variety which had reflexed sepals, but which bore flowers so small as to be insignificant, and placed it upon a large incurved variety, then he raised a number of seedlings thus hybridized and selected those which showed the most tendency to be reflexed, these he crossed with each other for several years until at last his object was gained. He took great pleasure out of the operation and sold the stock of his best seedling which he named "Duke of Wellington" for thirty pounds sterling. This was the first large flowered Fuchsia with reflexed sepals.

Another gentleman turned his attention to the Calceolaria (1) with a similar result. Calceolaria as a rule are either self-coloured or spotted, and he conceived the idea of obtaining some striped flowers ; this he did by noticing, that in some kinds, the spots ran together and showed a tendency to form lines. He took two of these and crossed them with each other and found by this means the tendency to become striped had increased. Thus, by a series of years of hybridization and selection he had a race of Calceolarias striped like a carnation, but the in-breeding had rendered them so weak that the plants died after once or twice blooming. These instances are given to show what may be done in this direction, and how new and improved varieties can be obtained, but the cases might be multiplied indefinitely. To those who have time and take a sufficient interest I would recommend to try the process ; they will find nothing in horticultural practice so exciting. To look for the seedlings as they flower and be continually expecting something new, is a most agreable occupation, and so great is the rage for novelties at the present time that something entirely new will fetch a good price and will repay the trouble and time expended.

GEO. MOORE.

CAMBIUM.

Not a few, even of those who know considerable about arboriculture, are well acquainted with the meaning of the term "cambium." We are apt to speak and think of the vital juice of a tree as "sap," but we must hear in mind that, while the term is correct, when the liquid called sap has undergone a process of elaboration in the leaf, it is no longer sap but cambium.

Receiving in its progress upward such soluble ingredients as it finds in its passage, it is still sap, but when these are acted upon by contact with the atmosphere, through the leaves, and are changed by evaporation of the superfluous hydrogen and oxygen, and the fixation of a certain amount of carbon and, sometimes ammonia, it is converted into such a form as to become the aliment of the tree.

It now commences its descent towards the roots, that is to say, in the opposite direction to that by which the sap had ascended ; but it never reaches the roots, because it is equally distributed over every portion of the tree and expends itself in making deposits of new tissue wherever required.

In other words the sap and cambium may be compared to the chyle and blood in animals.

In all exogenous plants—those whose growth is formed outside of the central cylinder : the principal deposit and assimilation of cambium forms a new concentric layer of woody matter, outside of the preceeding year's alburnum or sapwood, and a new layer of cortical or bark-matter inside the preceding years formation of liber or inner-bark. Hence during the season of growth, after the ascent of the sap, the cambium is found descending between the wood and the bark.

In animals, the circulation is continuous at all times and seasons and the supply of vital principle is always proceeding. In the vegetable kingdom it is not so, but growth takes place at one season of the year, namely in the spring and summer when the soil and atmosphere are ready to supply the necessary elements to accomplish the end. And then just as the blood in animals performs its various functions of making bone, muscle, cartilage, horn, hair, etc., so the same stream of cambium supplies material for wood, bark, buds, leaves, flowers, and fruit.

Some may be inclined to say all this is mere speculation and theory, but the fact of the ascent of the sap and descent of the cambium is easily proved. Thus, if we tap a maple or other exogenous tree while the sap is ascending copiously, it will run out, and in case of the grape vine, so freely as to cause death. And if we wait until the tree is in full development of its leaves and then tie a ligature tightly round one of its branches so as to prevent the free downward flow of the

(1) *Calceus*—a shoe. ED.

cambium, we shall soon see the growth of a vegetable tumour or excrescence caused by the checking and accumulation of the ingredients which would otherwise go to form the parts of the trees, as above stated. That these facts exist there is no doubt, but the wherefore is not so apparent ; the cause may be said to be partly chemical, and partly mechanical ; but after all we must full back upon the first principles and mystery, of life as no other satisfactory explanation can be given for the phenomenon.

What we may learn from the foregoing is that we must be careful that young trees in our charge should not be wounded or bruised at the time the sap is ascending, lest the vital fluid should be wasted, and that after its elaboration has been completed we may prune them with confidence that the healing process will be immediate and perfect because the ingredients are on hand, and the conditions proper to effect it.

The word cambium is derived from the Latin verb *cambio* to exchange and is very appropriate because, as has been stated, the moisture extracted from the earth for the sustenance of the tree becomes sap, then cambium, then cellular tissue, and finally the bulk of the whole with its organs of reproduction.

Thus, exchange, assimilation, and growth are gradually and surely progressing. As the season will soon be upon us when this process will commence another annual round, its study should be interesting, and although there is a mystery in all the works of Nature which we cannot fully explain, we can but exclaim with Addison :

" The hand that made them is Divine. "

GEO. MOORE.

REPLENISHING THE FOREST.

The *Philadelphia Ledger* calls attention to the result the great forest fires in Colorado may have upon the necessity for tree planting to replace those destroyed ; because it is feared that the loss of the timber may interfere with the water supply. But it appears to me that there is another reason why young trees should be planted as the old ones disappear, not only by fire, but by the woodmen's axe. There are vast districts of mountainous land which are unsuitable for agricultural purposes, but are admirably adapted for the rowth of forest trees ; from these mountainsides the timber is being removed and they are left barren or covered with useless scrub or almost useless wood. Although the woodlands of Canada are vast in extent they are not inexhaustible, and the question arises : have the present generation a right to deforest the land by wholesale, without making provision to recoup it for those who are to succeed them ? In an ancient corporation in England, Sutton Coldfield, in Warwickshire, there is a large domain which belongs to the Burgesses, given to the town in the reign of King John ; at the time the donation was made, the land was covered with timber, of which the *wardens* (officers appointed to conduct the business of the estate) were allowed to cut a certain quantity annually with the proviso, that for every thousand feet of timber sold, a certain number of young trees should be planted (there were some wise men in King John's day). The consequence of this plan is that during the centuries which have passed, the woodlands have not been depleted but have been, and are now, a continual source of revenue to the place. Had some of our ancestors here planted some young trees where they cut away they old ones, they would now have been, or soon would be, bringing in revenue to the present and rising generation, and it is for these that a man should work and scheme, not merely for himself alone in his little span of life.

A COMBINED POULTRY AND ANIMAL SHOW.

The exhibit of the Ontario Poultry Association held at the Pavillon, in the Horticultural Gardens, Toronto, last week, attracted widespread interest and attention. Both the American Poultry Association and the Toronto Poultry, Pigeon and Pet-Stock Association met at the same time, making the most complete poultry and pet animal show ever held in Canada. The management took unusual care in their arrangements for the live stock, and officially appointed the well-known firm Pickhardt-Renfrew Co., Limited, of Stouffeville, Ont., to disenfect the huge building with their Persiatic Hen House Spray and Poultry Powder. This official recognition of the high qualities of this sterling preparation is an endorsement not to be lightly overlooked by farmers and fanciers. It acts both as a disinfectant and insecticide destroying vermin and purifying the atmosphere of disease germ and gases, consequent upon the close confinement of fowls or animals. Can be purchased at all dealers.