day. When three years old, he won second prize at the Cheshire Agricultural Society's show in 1883, beating 6 others. In 1884, he won the first prize at the same society's show. In 1886, he took the second prize at the Royal Manchester, Liverpool, and North Lancashire Agricultural Society's show. He also bought the Hackney stallion Firefly, of which we gave an illustration in a recent issue. These are two very fine horses.

Messrs. Beith's catalogue, which has just come to hand, contains the pedigrees of 25 stallions and 6 mares, and contains more information concerning Clydesdales than any catalogue we have ever seen before, excepting Graham Bros'. We would advise all interested in Clydesdales to send for a copy, which will be sent free to those applying to Robert Beith & Co., Bowmanville, Ont. Those who wish to see a truly fine lot of horses should visit this stud. Bowmanville is forty miles east of Toronto, on the G. T. R.

The Science and Practice of Stock Feeding.

BY PROFESSOR G. H. WHITCHER,
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(Continued from last issue.)

The ordinary table would give the previously shown results in the following form:

	Digestible. Albuminoids.	Carbo-hydrates.	Fat.
Coin meal........	8.66	65.63	2.94
Shorts	14.17	43.84	3.20

In the tables given in this bulletin I propose to modify this form of statement, with the hope that it will very much simplify the matter of using them in practical work, and I will explain the modification at this point. It is customary to give what is called the *nutritive ratio* of each food. Warrington calls it the *albuminoid ratio*. This means the ratio of digestible albuminoids or nitrogenous matter, to the carbo-hydrates and *fat*, or non-nitrogenous matter, but as it has been found that a pound of *fat* will produce 2½ times as much *heat*, when burned, as a pound of *starch* or *sugar*, it has been assumed that the *fat* in fodders is 2½ times as valuable as the *carbo-hydrates* for feeding purposes, consequently in determining the *nutritive ratio* the fat is multiplied by 2½ and the product added to the carbo-hydrates. This has the effect of making the whole of the non-nitrogenous part of the food appear as starch or sugar. An example will best show how this is done. Take the corn meal above tabulated, there are 8.66 pounds of digestible albuminoids; there are of carbo-hydrates (starch, sugar, fibre etc.,) 65.63 lbs., of fat 2.94 lbs, multiplied by 2½ gives the equivalent of carbo-hydrate 7.35; the carbo-hydrate equivalent becomes 72.98; the ratio of nitrogenous to non-nitrogenous is as follows: 8.66 to 72.98, or as 1 : 8.4. This last is the nutritive ratio of corn meal. The modification alluded to is this: instead of giving the carbo-hydrates and fat in *separate* columns I shall multiply the *fat* in each food by 2½ and *add* it to the carbo-hydrates, and give the sum in one column under the term *carbo-hydrate equivalence*. The reason for this will appear in the practical work of computing rations, under "practical feeding."

The table last given would be changed to the following:

	Albuminoids.	Caıbo-hydrate equivalence.	Nutritive ratio.
Corn meal.......	8.66	72.98	1 : 8.4
Shorts........	14.17	51.84	1 : 3.6

What are the *uses of food* in the animal system?

Having considered what *food* is and finding it made up of parts having unlike qualities, it is very natural to ask if the albuminoids and carbo-hydrates are of equal value, and before this can be answered, it will be best to see why animals require food. Some of the uses of food may be best explained by comparing the animal to the locomotive. We will take the case of a locomotive, standing idle in the yard, with the temperature of the atmosphere at zero. Under these conditions heat is constantly being given off to the air, and, if left to itself, after a time the fire goes out, the water gradually cools off, until it freezes. This tendency is caused by what is known as *radiation* of *heat*, and the result is that the locomotive and air in time come to the *same temperature*. To prevent this, either wood or coal is burned in the fire box. An ox, standing in a cold barn, or out of doors, loses heat by radiation, just as the locomotive does, and if this loss was not made good in some way, it would only be a short time before the temperature of the air and the temperature of the ox would be alike. But as a matter of fact the temperature of the blood never varies much from 101° in health, and it makes no difference whether the air is at 30° below zero or at 90° above. The temperature of the body is kept up by the *food* consumed just as that of the locomotive is by the wood burned. Again, the fuel consumed by a locomotive while standing idle is only an amount sufficient to supply the loss of heat. This is a comparitively small amount. When the same locomotive is coupled to a train of loaded cars, and is started on an up grade, it will be found necessary to open the drafts and increase the consumption of fuel. In drawing this load, energy is required, and this is obtained from the extra fuel consumed. An ox or a horse, when drawing heavy loads, must also expend more energy than when standing in the stall, and to develope this energy requires more food; *food* is to the ox what *fuel* is to the locomotive.

There is one other object for which we feed, namely, the production of growth. Under this head comes increase of live weight, whether in growing animals or fattening ones, growth of wool, or the production of milk. If an animal weighs one hundred pounds at birth and fifteen hundred pounds when three years old, this gain of fourteen hundred pounds must come from the food and water used. If a cow yields annually six thousand pounds of milk, this also must come from the food and water consumed.

The uses of food, then, are: To produce heat; to produce force, (muscular energy); to produce new tissue, (including increase of live weight, growth of wool, or yield of milk).

Having noted the use to which food is put we may inquire whether one part of the food is better adapted to one requirement, and another part to another requirement, or whether all the digestible parts are equally effective.

1st. What part of the food produces heat. The best authorities answer this by saying that the changes which take place in all parts of the body produce heat. The contraction of a muscle, the activity of the liver, etc., all liberate heat, and hence it cannot be said that one constituent of the food more than another is the source, but that both the nitrogenous and non-nitrogenous contribute toward keeping up the temperature.

2nd. Force is produced in much the same way as heat, from all the constituents of the food.

3rd. New tissue. There has been much conflicting testimony on the formation of new tissue, the chief difficulty being to find the source of fat. At first, it was held that the animal only sorted out and stored the fat already existing as fat in the food. Experiments soon showed that the fat produced by pigs, and in the milk of cows, largely exceeded that taken into the system in the food. It was then held that the albuminoids might make up the deficiency, or by others, that the albuminoids were the only source of fat. Laws & Gilbert showed, in certain experiments that they carried on, that not only was there a lack of fat in the food, but that the fat and albuminoids taken together could not produce all the fat that was stored up, and consequently that the starch or sugar of the food *must* have contributed. It may be safely said that the elements from which the animal fats are made up come from the albuminoids, carbo-hydrates and fat. It is probable that the muscle and other nitrogenous parts of the animal come from the albuminoids of the food. This, however, is not fully concurred in by all physiologists.

The changes which food undergoes in the animal system are very complex; and just how hay grain, cottonseed, grass, ensilage, etc., are changed into milk, muscle, blood, wool, fat, etc., is a problem which physiological chemistry has not yet definitely solved.

The whole object of this brief discussion of the principles of animal nutrition is to enable us to understand the meaning and use of the *stock feeding tables* which have been prepared for us, and as an intelligent use of these tables cannot fail to improve the methods of feeding too often practiced in this country. I shall try to show just what the tables are and how they are to be used.

(TO BE CONTINUED.)

Veterinary.

Contagious Diseases.

BY C. H. SWEETAPPLE, V. S.

As mentioned in my last article, the nature of the contagious principle—the microbe—of communicable diseases is a discovery almost of yesterday. The mystery that surrounded the origin and development of "the pestilence that walketh in darkness," devastating the home and the hearth, the stable, the herd and the flock, has been in a great measure dispelled. Still we have much to learn; there is much yet to be discovered.

The contagious and infectious diseases are those which have ever been most destructive and most intractable. Some of these are special to the human race, others to one or more species of animals, while some are readily transmissible from species to species. Many of those diseases affecting the lower animals can be conveyed to man. Of rabies, glanders and anthrax, many sad and fatal cases are recorded, and the transmissibility of tuberculosis from the lower animals to man, and from man to the lower animals, can no longer be disputed.

Canada fortunately has been, and still continues, singularly exempt from the fatal contagious diseases that have, at different times, prevailed to a greater or less extent over almost all other parts of the world. We certainly occasionally find a local outbreak of glanders in the horse, but as the law now exists in the Province of Ontario, the disease is readily suppressed as soon as it is recognized, and never assumes alarming proportions.

With regard to anthrax, that most fatal and widespread of all the diseases of the lower animals, it is safe to say that throughout the length and breath of our fair Dominion the disease has never existed so as to cause serious alarm. There certainly has been an outbreak or two reported in the North-west, and I believe in the east, in the Maritime Provinces, but they were merely of a local character. In Ontario we occasionally find diseases of an anthracoid nature, such as braxy in sheep, and quarter-ill or black quarter in young cattle, but they have not caused general alarm, as they do not appear to be readily transmissible, not having spread be-